

2006

Integrated Water Quality Monitoring and Assessment Methods

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2006 Integrated Water Quality Monitoring and Assessment Methods

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List of Acronyms and Abbreviations

AGWQN	Ambient Ground Water Quality Monitoring Network
AMNET	Ambient Biological Network
AQLa	Aquatic Life Acute
AQLc	Aquatic Life Chronic
AU:	Assessment unit.
BMP(s)	Best Management Practice(s)
BPJ	Best Professional Judgment
ASMN	Ambient Stream Monitoring Network
C1	Category 1
CALM:	Comprehensive Assessment and Listing Methods
CCMP:	Cooperative Coastal Monitoring Program
CEHA:	County Environmental Health Act
CLP	Clean Lakes Program Phase I diagnostic studies
DF	Dissolved fraction
DFW	Division of Fish and Wildlife
DO	Dissolved Oxygen
DRBC	Delaware River Basin Commission
DRP	Dissolved Reactive Phosphorus
DSRT	Division of Science, Research and Technology
DWQS	Drinking Water Quality Standards
EQUIS	Earthsoft's EQUIS
EWQ	Existing Water Quality (network)
FC	Fecal Coliform (bacteria)
FW	Fresh Water
FW1	Fresh Water Category 1
FW2	Fresh Water Category 2
GIS	Geographic Information System
GW	Groundwater
GWIA	Groundwater Impact Areas
HE	Harbor Estuary Program
HH	Human Health
HUC	Hydrologic Unit Code
IBI	Index of Biotic Integrity
IEC	Interstate Environmental Commission (formerly Interstate Sanitation Commission)
LWQA	Lake Water Quality Assessment Reports
CWA	Federal Clean Water Act
MA1CD10	minimum average 1 day flow with a statistical recurrence interval of 10 years
MA7CD10	minimum average 7 day flow with a statistical recurrence interval of 10 years

MA30CD5	minimum average 30 consecutive day flow with a statistical recurrence interval of 5 years
MCL	Maximum Contaminant Level
MDL	Maximum Detection Limit
MPN	Most Probable Number (of Fecal Coliform bacteria)
NAWQA	National Ambient Water Quality Assessment
NJ	New Jersey
N.J.A.C	New Jersey Administrative Code
NJADN	New Jersey Air Deposition Network
NJDEP	New Jersey Department of Environmental Protection
NJDHSS	New Jersey Department of Health and Senior Services
NJIS	New Jersey Impairment Score
NJPDES	New Jersey Permit Discharge Elimination System
NJLMP	New Jersey Lake Management Program Reports
N.J.S.A.	New Jersey Statutes Annotated
NO ₂	Nitrite
NO ₃	Nitrate
NRCS	National Resource Conservation Service
NSSP	National Shellfish Sanitation Program
NWIS	<u>National Water Information System</u> . USGS's water information database
NY	New York
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
P.L.	Public Law (federal)
PPM:	parts per million
PPB	parts per billion
QUAPP	Quality Assurance Project Plan
RF3	River Reach File 3
RBP	Rapid Bioassessment Protocol
SC	Saline coastal
SE	Saline Estuary
SIIA	Sewage Infrastructure Improvement Act
SRP	Site Remediation Program
STORET	<u>Storage and Retrieval</u> , USEPA's water quality database
STP	Sewage Treatment Plant
SWAP	Source Water Assessment Program
SWQS	Surface Water Quality Standards
TCE	Tetrachloroethylene
TIBC	(Interagency) Toxics in Biota Committee
TMDL	Total Maximum Daily Load
TIN	Total Inorganic Nitrogen
TM	Trout Maintenance
TP	Total Phosphorus or Trout Production
TR	Total Recoverable

TSS	Total Suspended Solids
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WCE	Water Compliance and Enforcement
WLA	Waste Load Allocation
WMA	Watershed Management Area
WQ	Water Quality
VOC	Volatile Organic Compound
305(b):	Water Quality Inventory Report
303(d):	Impaired Waterbodies List

1.0 Introduction

1.1 Background

The US Environmental Protection Agency (USEPA) began issuing guidance (USEPA 2001) for the development of an Integrated Water Quality Monitoring and Assessment Report (Integrated Report) by the States beginning with the Year 2002 submittal. This guidance recommended for the first time that States integrate their Water Quality Inventory Report (Section 305(b) of the Clean Water Act) with their Impaired Waterbodies List (Section 303(d)). USEPA reiterated this recommendation in their guidance for the 2004 List (USEPA 2003) and once again for the 2006 List (USEPA 2005).

The New Jersey Department of Environmental Protection's (Department) 2006 Integrated Report is intended to provide an effective tool for maintaining high quality waters and improving the quality of waters that do not attain their designated uses. The Integrated Report also provides water resource managers and citizens with detailed information regarding the following:

- Delineation of water quality assessment units providing geographic display of assessment results;
- Methods used to assess Designated Use attainment status;
- Designated Use attainment status;
- Management strategies (including Total Maximum Daily Loads (TMDLs) under development to attain water quality standards;
- Pollutants and waters requiring TMDLs ;
- TMDL development schedules;
- Progress toward achieving comprehensive assessment of all waters;
- Additional monitoring needs and schedules.

The USEPA Guidance for developing the 2006 Integrated Report (USEPA 2005) recommends placing the assessment results into one of five specific categories. (Note: The Department has chosen to use the term “sublist” rather than “category” when referring to the five parts of the Integrated List to eliminate confusion between the Category 1 of the Integrated List and Category 1 waters under Surface Water Quality Standards (SWQS)).

The Department elected to develop an Integrated Report for New Jersey since this approach offers several significant improvements and challenges over the traditionally separate Water Quality Inventory and Impaired Waterbodies List Reports. Through the Integrated Report, the USEPA and the Department have begun to implement recommendations regarding comprehensive monitoring strategies included in the National Research Council's Report *“Assessing the TMDL Approach to Water Quality Management”* (National Research Council, 2001). This report emphasizes the importance of science-based decision-making in both monitoring and assessment for developing an effective water quality management program.

The Integrated Report combines the non-regulatory requirements of the Water Quality Inventory Report (305b) with the regulation-based List of Impaired Waterbodies (303d) which mandates TMDL development. The success of integrating the previous reports into a single report requires an awareness of requirements and procedures. In particular, Sublist 5B of the Integrated Report represents the USEPA reporting requirements under Section 303d (Impaired Waterbodies), and the remaining sublists represent assessment under Section 305b (Water Quality Inventory). The regulatory requirements (i.e., USEPA approval and adoption; public participation, etc.) for the 303d impaired waterbodies listing, therefore, apply only to Sublist 5B of the Integrated Report.

The Integrated Report improves water quality reporting by providing detailed descriptions of data sources and assessment methods as a basis for sound, technical assessment decisions. In addition, assessment results are represented in a spatial context, presenting a clearer picture of water quality across the state. Monitoring needs and schedules are described, facilitating the articulation of monitoring priorities and identifying opportunities for cooperation with other agencies and watershed partners. TMDL needs and schedules, as well as other management strategies, are defined to convey plans for water quality improvements. Finally, the public participation aspects provide opportunities for data submittal and open discussion of water quality assessment methods and results.

The methods used to develop New Jersey's Integrated Report are described in this document (Methods Document). The goal of the Methods Document is to provide an objective and scientifically-sound waterbody assessment methodology including:

- A description of the data the Department will use to assess attainment of the designated uses;
- The quality assurance aspects of the data;
- A detailed description of the methods used to evaluate designated use attainment;
- The rationale for the placement of waterbodies on one of the five sublists.

The Methods Document is a companion to the Integrated Report. It is anticipated that this is an evolving document that will be modified, as appropriate, to reflect changes in assessment methodology from one reporting cycle to the next.

1.2 Summary of Major Changes from the 2004 Methods Document

Reporting. USEPA uses the terms “assessment unit” and “waterbody” interchangeably. The Department decided to use the term “assessment unit” when referring to the spatial extent of a waterbody being assessed. USEPA's Guidance for the 2006 List no longer recommends an assessment unit be included in only one of the 5 sublists (i.e., the sublist that conveys the highest degree of impairment) as a result of the integrated assessment. The Department had always thought this approach could result in an overly negative view

of water quality and, in 2002, the Department chose to develop the Integrated List by assessment unit/parameter combinations, not just by assessment unit (i.e. the Metedeconk River, NB at Jackson is listed on Sublist 1 for nitrates, Sublist 3 for pH and TSS and on Sublist 5 for aquatic life, phosphorus and fecal coliform). Placing assessment units on more than one sublist allows the public to better gauge progress. The various sublists of the Integrated List are described in detail in Section 7, Integrated Listing Methodology.

For the 2006 Integrated Report, the Department has identified a suite of parameters that will serve as the minimum data set associated with each designated use within each assessment unit. Each assessment unit will be evaluated for attainment of the designated use(s), if the minimum data set is available, and listed as either "attain" if the data indicate the use(s) as being met or "non-attain" if the data indicate otherwise.. If additional data is available and relevant to the designated use, it will be considered in the listing decision. If the minimum data set is not available, the assessment unit will be place on Sublist 3, (insufficient data). Thus, an assessment unit may be listed in one or more sublists depending on the results of the assessment. (i.e., on Sublist 2 for drinking water, Sublist 3 for aquatic life and Sublist 5 for recreation). If all uses are assessed and attained, the assessment unit will be placed on Sublist 1. If one or more designated uses are assessed as "non-attain", the pollutant(s) causing the non-attainment status will be identified on Sublist 5 when known. When the pollutant causing non-attainment is not known it will be listed as "pollutant unknown".

Use of ADB. The Assessment Database (ADB) is a relational database application for tracking water quality assessment data, including use attainment, and causes and sources of impairment. States need to track this information and many other types of assessment data for thousands of waterbodies, and integrate it into meaningful reports. The ADB is designed to make this process accurate, straightforward and user-friendly.

The ADB supports three principal functions:

- Improve the quality and consistency of water quality reporting
- Reduce the burden of preparing reports under Sections 305(b), 303(d), 314, and 319 of the Clean Water Act (CWA)
- Improve water quality data analysis

The ADB provides user-friendly data entry forms and automates the production of reports that States submit to EPA through the 305(b) process. USEPA is revising ADB to accept a waterbody/designated use approach. If the necessary changes are made in time to the ADB, the Department anticipates using the ADB for reporting its 2006 assessment results to EPA.

Spatial Extent. In previous Integrated Reports, New Jersey used hydrology, specifically stream order, to extrapolate the extent of attainment or impairment from the area monitored and assessed to a larger stream segment. As the Department increased the scale of resolution for rivers and streams (once 1:100,000; now 1:24,000; soon to be 1:2,400), the number of unassessed waters and stream miles increased. Since this increase of the number of unassessed waters is incompatible with the goal of providing a comprehensive

assessment of state waters, the Department developed a new spatial extent methodology that uses watershed delineations to represent assessed waterbodies. Using the watershed spatial extent method, the state's waters are delineated based on Hydrologic Unit Code (HUC) 14 subwatersheds. A HUC is a geographic area representing part or all of a surface drainage basin or distinct hydrologic feature as delineated by the U.S. Geological Survey on State Hydrologic Unit Maps. Monitoring site(s) located within the HUC 14 subwatersheds are extrapolated to represent the waters within the entire HUC boundary.

De minimis: During the assessment process, the Department may identify small isolated areas that do not meet the designated use(s) but which are considered *de minimis*, or of little significance, to the overall assessment of the waterbody. Most *de minimis* areas are small bathing beaches and isolated shellfish restrictions. These *de minimis* areas will be identified in the Integrated Report and are regulated for remediation under other programs such as National Shellfish Sanitation Program and the Department of Health and Senior Services.

2.0 Statutory Authority and Guidance

The rules, regulations, and guidance that are relevant for the development of the Integrated Report are briefly discussed below.

The Federal Water Pollution Control Act and its subsequent amendments are collectively known as the Clean Water Act (CWA). The CWA provides the statutory requirements for numerous water programs including Surface Water Quality Standards, Water Quality Inventory Report, Impaired Waterbodies List, and Total Maximum Daily Loads (TMDLs).

Surface Water Quality Standards (SWQS) include water quality goals, policies, numeric and narrative criteria, and applicable design flows and waterbody classifications. Federal SWQS are promulgated by the USEPA. As required, New Jersey has adopted SWQS that are at least as stringent as the federal standards. The latest revisions to the New Jersey SWQS were adopted at N.J.A.C. 7:9B on June 20, 2005 and include designated uses, use classifications and water quality criteria for the State's waters based upon such uses and the Department's policies concerning these uses, classifications and criteria. The numerical criteria for some toxic parameters are found in USEPA's National Toxics Rule (CFR, 1989). The Delaware River Basin Commission (DRBC) adopted standards for the Delaware River, estuary, and tributaries to the head of tide (DRBC, 1996). The New Jersey Department of Health and Senior Services (NJDHSS) establishes sanitary quality standards and beach closure procedures for ocean, bay, and lake bathing beaches (NJDHSS, 2004). Sanitary criteria for shellfish harvesting in coastal waters are set by the Federal Food and Drug Administration (FDA) through the National Shellfish Sanitation Program. The terms "applicable SWQS" and "applicable criteria" refer to the legally binding SWQS and criteria for the waterbody depending on jurisdiction and waterbody classification.

Water Quality Inventory Reports (305(b)) are prepared every two years by states and submitted to the USEPA as required under Section 305(b) of the CWA and contain assessments of water quality and descriptions of water resources management programs. These reports are used by Congress and the USEPA to establish program priorities and funding for federal and state water resources management programs. The USEPA issues guidance as needed regarding the preparation of water quality inventory reports.

Impaired Waterbodies Lists (303(d)) are required under Section 303(d) of the CWA. Federal regulations on implementation of the CWA can be found at 40 CFR 130.7. New Jersey regulations regarding Impaired Waterbodies Lists are found at N.J.A.C. 7:15-6. These regulations require identification of impaired waterbodies: those waters for which required pollution controls were not stringent enough to achieve the state's surface water quality standards. The state is required to establish TMDLs for the impaired waterbodies based on a priority ranking. Impaired Waterbodies Lists are required every two years and must be based on a documented methodology that includes an evaluation of existing and

readily available data. Waterbodies continue to be included on subsequent Impaired Waterbodies Lists until: 1) TMDLs are completed; 2) Applicable criteria are met; or 3) The original basis for the listing is shown to be flawed (See Section 7.3). Public participation in the development of Impaired Waterbodies Lists is required (See Section 11). The USEPA is required to review and approve each state's 303(d) List. In New Jersey, the final 303(d) List (Sublist 5B) is adopted as an amendment to the Statewide Water Quality Management Plan as required in N.J.A.C. 7:15-6. (See Section 11).

A TMDL specifies the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and allocates pollutant loadings among point and nonpoint pollutant sources. TMDL implementation may result in more stringent discharge permit limits and/or non-point source best management practices (BMPs).

Integrated Report Guidance: The USEPA provided guidance to the States for developing Integrated Reports (USEPA 2001, USEPA 2003). The guidance for the 2006 Integrated Report is available on the web at <http://www.epa.gov/owow/tmdl/2006IRG> and an overview of how the Department assesses waters based on this approach is described in Section 8.0 (Integrated Listing Guidance Methods). The Integrated Report guidance does not alter the statutory provisions in sections 305(b) and 303(d) of the Federal Clean Water Act, nor does it change existing rules governing development of the Impaired Waterbodies Lists discussed above. However, the guidance does update previous guidance and supersedes previous guidance. The USEPA recommends the use of five sublists to convey water quality standards attainment status.

The Integrated Report Guidance emphasizes the importance of monitoring and assessing waterbodies in each sublist to obtain the information needed, assess progress toward attainment of SWQS, address data gaps, and ensure that waterbodies which currently meet SWQS continue to do so.

3.0 Spatial Extent of Assessments

Currently, water quality and biological monitoring are performed at sampling sites throughout the state's waters. Reporting requirements in CWA sections 305(b) and 303(d) require that these point assessments be extrapolated to river miles, lakes, or coastal waters, and be reported either as linear miles, acres, or square miles for 305(b) or as discrete waterbodies for 303(d). Spatial extent is the methodology employed by the Department to extrapolate water quality status from a point (the monitoring location) to discrete stretches of streams or waterbodies (for lakes and coastal waters).

In accordance with EPA's requirement for states to assess all waters, the Department has reevaluated its spatial extent method for the 2006 Integrated Report. In the 2002 and 2004 Integrated Reports, New Jersey used spatial extent assessments based primarily on hydrology, specifically stream order, to determine spatial extent that often excluded small tributaries to extrapolate monitoring assessments. However, with the advances of technology, the resolution for rivers and streams significantly increased within the state's GIS system (once 1:100,000; now 1:24,000; soon to be 1:2,400). As hydrologic resolution increased, the number of small tributaries increased, creating a significant increase in river miles and unassessed waters. Since this expansion of unassessed waters is incompatible with the goal of comprehensive assessments of state waters, a new spatial extent method was developed to help resolve this issue since the expansion of the monitoring networks to cover all small tributaries is not fiscally possible. The 2006 spatial extent method is based on watershed delineations.

This new method provides a more comprehensive coverage of the state's waters, permanent assessment unit delineations (assessed area will not change as the sampling sites change), flexibility to incorporate smaller tributaries as hydrologic resolution increases in the future, and accurately reflects areas requiring regulatory enforcement. Identifying waters as estimated or monitored will allow the Department to extrapolate assessments over a larger area (HUC 14) for a general statewide assessment and identify specific waters with known impairments for TMDL development.

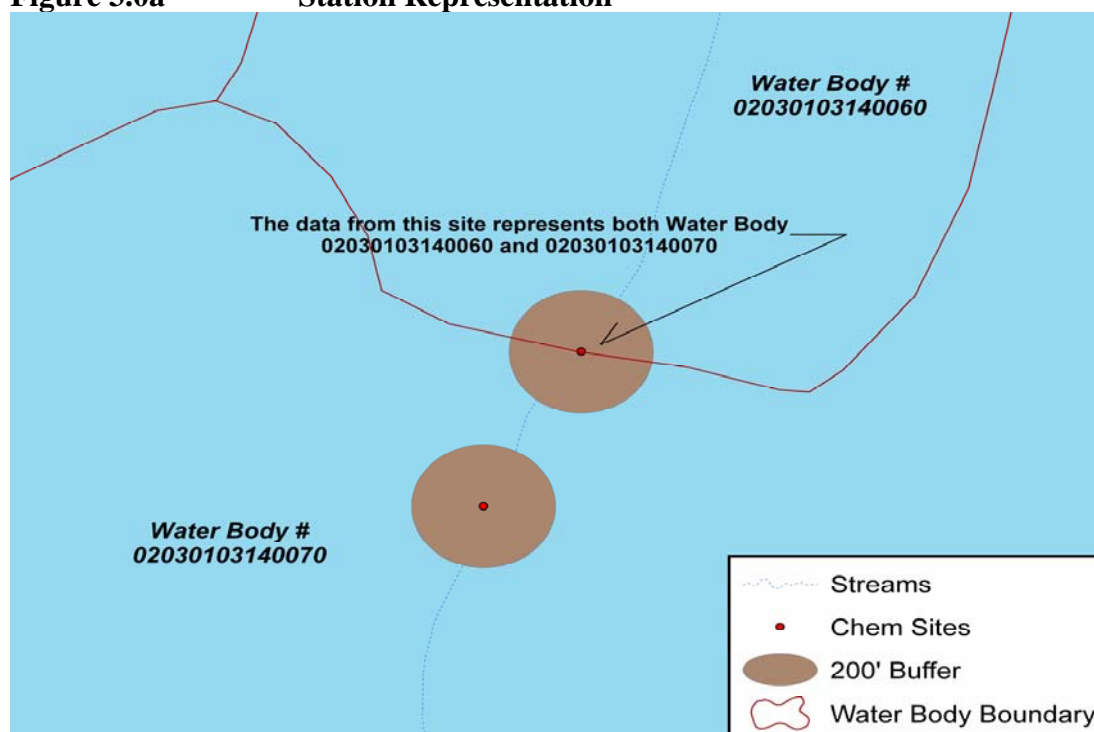
In the subwatershed spatial extent method for rivers, the state's waters are delineated based on Hydrologic Unit Code (HUC) 14 subwatersheds. A HUC is a geographic area representing part or all of a surface drainage basin or distinct hydrologic feature as delineated by the U.S. Geological Survey on State Hydrologic Unit Maps. HUC 14's range in size from 0.1 to 42 square miles with an average size of 8.5 square miles. Monitoring site(s) located within the HUC 14 subwatersheds are extrapolated to represent all streams and tributaries within the HUC boundary.

Assessment Unit Identification. Each assessment unit was delineated from the State of New Jersey's HUC 14 Coverage. This HUC 14 coverage has a 14 digit numbering system associated with each polygon. This 14 digit code will become the assessment unit

ID. The HUC 14 coverage also has a unique name associated with each HUC. This name will become the assessment unit name. The Department decided to split some HUC units as described above in Section 3.1. After a HUC 14 was split, an assessment unit identification system had to be derived for the newly created HUC. The new ID's were determined using the original HUC 14 numbering system, with the addition of a two digit ID number added to the end. For example HUC 14 with the 14 digit code of 02030104010030 had to be cut into two separate assessment units. The new assessment units are now identified as 02030104010030-01 and 02030104010030-02. The new HUCs will keep the assessment unit name with "upstream" or "downstream" added.

Station Representation. It is common for monitoring sites to be placed at the terminus of one HUC as it flows into an adjacent HUC. It was decided that if a monitoring site fell within 200 feet of the delineation along a contiguous length of stream, the assessment based upon that site would apply to both the HUC containing the site and to the adjacent HUC as shown in Figure 3.1a below. This assignment is made provided that there are no significant tributaries, impoundments, or other hydrological alterations that could impact water quality between the monitoring site and the neighboring HUC. In addition, stations whose 2004 spatial extent extending into an adjacent HUC were also evaluated on a case by case basis to determine if the data from these stations should be used in assessing the adjacent HUC. Once again, significant tributaries, impoundments, or other hydrological alterations as well as land use and major roads that could impact water quality between the monitoring site and the neighboring HUC were used in the evaluation.

Figure 3.0a Station Representation



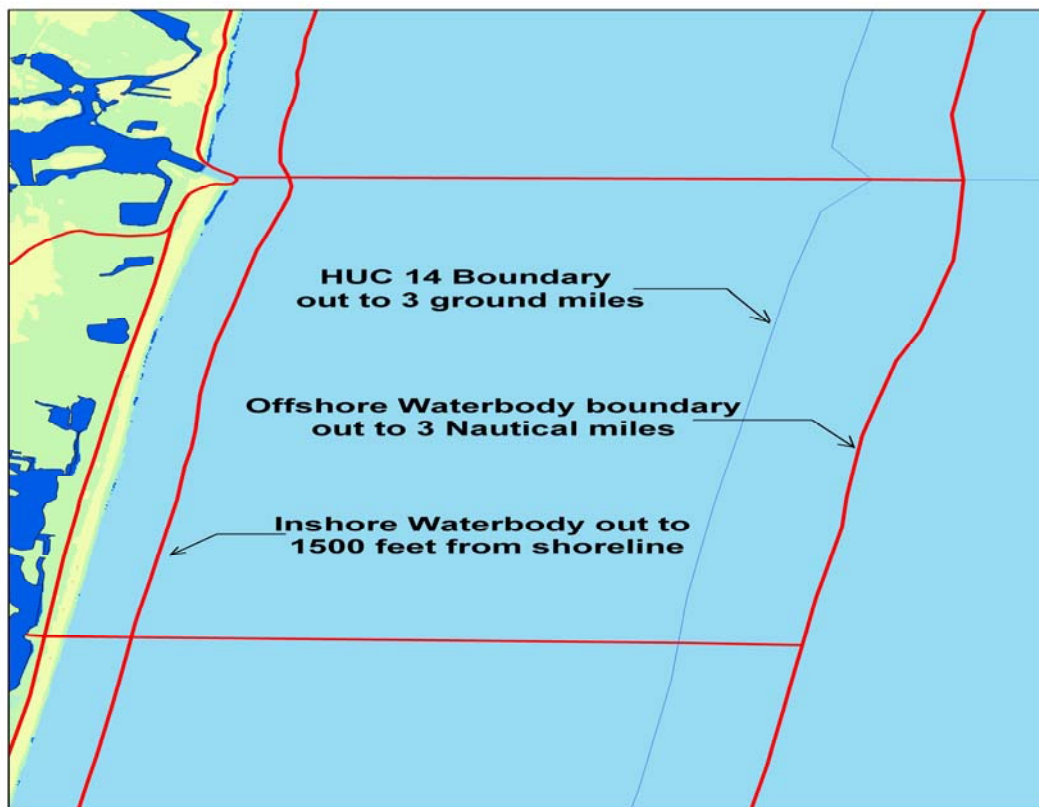
Assessment Scope. Most of the assessment units (HUCs) have information from a single monitoring station, but there are situations where the assessment units have data from multiple monitoring stations. The Department will use a weight of evidence approach to determine if all data within the assessment unit is of equal value (See Section 5 on Weight of Evidence). When all data is of equal weight, the worst case assessment results will apply to the entire assessment unit. If there is data from multiple stations whose data strongly suggest that substantial areas of the assessment unit are significantly different and warrant different assessments, the Department may choose to divide the assessment unit into smaller assessment units. However, it is the Department's desire that the assessment units remain as consistent as possible over multiple assessment cycles to allow the development of trends and facilitate tracking of waterbodies from one cycle to the next, and therefore, will subdivide an assessment unit in as few cases as possible.

3.1 Assessment Units in Coastal Waters

For estuaries, the previous spatial extent method was based primarily on dissolved oxygen sites and shellfish classification areas to determine assessment unit delineations. Since the classification areas are updated each year and dissolved oxygen sites can change, the assessment unit boundaries and the stations within an assessment unit constantly changed. As the number of waterbodies varied from reporting cycle to reporting cycle, it became extremely difficult to track trends for a particular assessment unit and the need for more permanent assessment unit delineations was evident. Similar to the rivers and streams for the 2006 assessment, the spatial extent method for the estuaries are based on HUC 14 subwatersheds that are adjusted or divided to incorporate delineations based on hydrology (i.e., bays, inlets, inshore/offshore).

All HUC's that are located along the New Jersey coastline have been divided and realigned. The original HUC 14 delineations along the coast extended perpendicular to the shore out 3 statute miles. The offshore boundary of the HUC was enlarged by extending the boundary from 3 statute miles to 3 nautical miles which represents the jurisdictional water of the New Jersey (see Figure 3.1a). The 3 nautical miles is also consistent with the boundaries employed by the Bureau of Marine Water Monitoring in delineating the shellfish harvest waters under the National Shellfish Sanitation Program. In addition, previous Integrated Reports used the 3 nautical miles to represent assessed ocean waters. The HUCs are then divided into a nearshore HUC extending perpendicular to the shore 1500 feet out and an offshore area extending from 1500 feet to the 3 nautical mile boundary. The inshore HUC represents the outward extent of the designated bathing beaches along the Atlantic coast. For example HUC 14 with the 14 digit code of 02030104010030 had to be cut into two separate assessment units. The new assessment units are now identified as 02030104010030-01 and 02030104010030-02. The new assessment units are now identified as 02030104010030-01 and 02030104010030-02. "Inshore" and "offshore" were added to the HUC assessment unit names for the HUCs located along the coast.

Figure 3.1a **Offshore HUC Extensions**



3.2 Lake Assessments. Unlike streams and coastal waters, lake coverages were not clipped to HUC-14sub watersheds due to technical issues involving the lake National Hydrography Dataset coverage. The original intention was to associate lakes with their corresponding HUC-14 drainage in the manner applied to streams and coastal waters. For the 2006 Integrated List, each lake will instead represent an individual assessment unit, identified by the suffix “L” following the identification number. Once these technical issues are surmounted, the Department will proceed to assign lakes to respective HUC-14 sub watersheds in future Integrated Lists.

4.0 Designated Use Attainment Assessment Methods

The SWQS identify specific designated uses for the waters of the State according to their waterbody classifications. Designated uses include:

- aquatic life support (maintenance, migration, and propagation, see section 4.1 below),
- recreation,
- fish consumption,
- shellfish harvesting for the purpose of consumption,
- drinking water supply,
- industrial water supply, and
- agricultural water supply.

The Department uses both numeric and narrative criteria to protect designated uses. Narrative criteria are descriptions of the conditions necessary for an assessment unit to attain its designated uses while numeric criteria are concentration values deemed necessary to protect designated uses. To implement narrative data, which are qualitative in nature, the Department has identified assessment approaches, also known as “translators”, to quantitatively interpret narrative criteria. This section outlines the assessment methodologies for designated use attainment that include the utilization of both numeric and narrative criteria.

The designated use will be evaluated as attaining or non-attaining if a minimum data set is available. The minimum data set for each designated use is described in Table 4.0 below.

Table 4.0 Minimum Data Requirements

Designated Use	Data Requirements
Aquatic Life Support	Benthic macroinvertebrate data and fin fish data are preferred. If biological data not available, the preferred data set consists of pH, DO, temperature, total phosphorus, TDS and TSS. DO is the minimum data set.
Recreation	Enterococcus or fecal coliform or E. coli (Human health) Total phosphorus and DEP lake use questionnaire (Aesthetic)
Fish Consumption	Fish Consumption Advisories for one or more parameters
Shellfish Harvesting For Consumption	Fecal coliform or total coliform
Drinking Water Supply	The preferred data set includes metals, toxics, nitrate, TDS, chloride, or source water use restrictions. The minimum data set is nitrate.
Industrial Water Supply	TSS and pH
Agricultural Water Supply	TDS and salinity

4.1 Aquatic Life (AL) Designated Use Assessment

Biological Data and Assessments: General Considerations. Whenever possible, the Department prefers to assess the health of aquatic biota (and hence the degree to which a waterbody supports the Aquatic Life Designated Use) directly through assessment of biotic communities. These direct biological indicators integrate a full suite of environmental conditions over many months (for macroinvertebrates) to many years (for fish-based indicators). In contrast, chemical data such as dissolved oxygen, pH, etc., represent indirect methods to assess the health of the biology. These data show the condition of the water at brief moments in time.

The Department would prefer to base its Aquatic Life assessments upon benthic macroinvertebrate data used in conjunction with finfish community data and supplemented with a broad suite of biologically relevant physical/chemical data (e.g., dissolved oxygen, temperature, toxic pollutants). Currently, due to unresolved issues regarding the fish assessment metrics; fin fish data are limited to certain locations and assessment categories (see “Fin Fish Assessment” later in this section). With regard to the use of chemistry data; there are many more benthic sites in New Jersey (greater than 800) than chemistry sites, and, hence, many biological sites lack corresponding chemistry data. In some instances, chemistry sites have no biological data. While the Department is steadily working to expand both fish and chemical monitoring to achieve as close to the ideal dataset as possible for each waterbody assessed, the Department has developed methods to make scientifically based AL assessments when only biological or only chemical data are available. River and stream biological assessments for the 2006 Integrated List will be based principally upon benthic macroinvertebrates, used in conjunction with physical/chemical data whenever available. At selected sites, fin fish population data will be employed as an additional assessment tool.

Note that if physical/chemical data are available and violations of aquatic life based criteria are found accompanying observations of impaired biota, the waters will be listed in nonsupport and listed by the parameter in violation. Waters assessed using biological data with no chemistry data showing violations of an AL based criterion will be listed as “pollutant unknown.”

Surface Water Quality Standards. Fresh waters of the State are classified as either FW, which is the general surface water classification applied to fresh waters in New Jersey, or PL which is the general surface water classification applied to Pinelands waters (both Preservation and Protection Areas).

The aquatic life assessment methods discussed in this manual differentiate between these two classifications due to their widely differing water quality and biological characteristics.

The Aquatic Life Designated Uses as worded in the NJ Surface Water Quality Standards (N.J.A.C. 7:9B-1.12) include:

- 1) To be “Set aside for posterity to represent the natural aquatic environment and its associated biota” for FW1 waters of the State;
- 2) The “maintenance, migration, and propagation of the natural and established biota” for FW2, SE1, SE2, and SC waters; and,
- 3) The “maintenance and migration of fish populations, the migration of diadromous fish, and the maintenance of wildlife” for SE3 waters.

Currently, because numerical biocriteria for assessment of aquatic life have not been adopted in the SWQS, the biological indicators employed are regarded as “translators” reflecting the use support status in light of the narrative aquatic life criteria denoted in the previous paragraph.

Flow Effects and Biological Sampling: Research by the USGS has indicated that insufficient base flow can have detrimental effects on aquatic macroinvertebrate populations. The Department is currently investigating this issue more closely through several research projects being performed in cooperation with the USGS. The Department realizes that in some cases, non-attainment of use may be due to extended drought. If sites reflect impaired status due to extensive drought-induced low flow conditions that are not known to be anthropogenically aggravated, they will be assigned to Sublist 3 pending a re-assessment or assessed as reflecting natural conditions. As a general principle when biological data are reviewed, biological communities are expected to possess unimpaired communities when assessed waters have been and are at or above the MA7CD10 design flow.

Considerations Regarding Multiple Lines of Evidence: The Department will evaluate the strength of the various data sources to determine aquatic life use support. Examples below denote situations where chemical water quality data might result in a determination that the waterbody does not support aquatic life use even though the benthic macroinvertebrate (AMNET) monitoring indicated a non-impaired status. Note that all scenarios are based upon the fact that 1) AMNET sites indicate nonimpaired conditions and 2) Chemical monitoring indicate violations of a AL criterion for one or more chemical constituent at a co-located chemical site.

- More recent chemical sampling shows violations of the water quality criteria although older AMNET results indicate no impairment.
- AMNET site in most recent assessment displays a decline in NJIS score reflecting a downward trend in biological condition between Round I and II assessments or Round II and III, which ever dataset is most recent. For example, in Round I a site has a NJIS score of 27 or 30, then is reassessed during Round II as having a score of 24.
- NJIS score is 24, which is the lowest score within the "nonimpaired" condition.

- Studies, including those required under the Phosphorus Exit Ramp, suggest that algal growth is excessive and the waterbody may be rendered unsuitable for its designated uses.
- Where the chemical violations are known to impact a biological group such as fin fish and/or periphyton.

Conversely, the Department will evaluate the strength of data and may determine not to list a waterbody as impaired for aquatic life when violations of aquatic life criteria are observed but the AMNET results indicate no impairment.

- Violations of pH, temperature or dissolved oxygen in FW2-NT waters which represent a natural condition.
- Violations of chronic aquatic life criteria observed under high flow conditions which are not representative of a four day period.

Benthic Macroinvertebrates. The most spatially complete and robust biological indicator currently employed for the assessment of biological condition (and hence the degree of support of the Aquatic Life Designated Use) in rivers and streams is benthic macroinvertebrates (bottom dwelling organisms, such as insects, crustaceans, snails, and worms). The indicator is applied statewide with the exception of the Pinelands Region of New Jersey (PL waters) where the unique nature of streams contained there require that alternative assessment methods be employed (see “Designated Use Assessment of PL Waters” later in this section for additional information).

All macroinvertebrate sampling must be conducted in accordance with USEPA guidance (USEPA 1989) and the Department’s field sampling procedures (NJDEP 1992). Quality control measures must be consistent with USEPA procedures (USEPA 1999) and all specimen identifications must be performed by a qualified biologist.

Initially, macroinvertebrate data collected under New Jersey’s Rapid Bioassessment Protocol (RBP) was evaluated employing the New Jersey Impairment Score (NJIS) scoring system for any stream location in the state. As the Department reviewed results, it became apparent that some assessments extended beyond the extent for which the indicator had been calibrated. In response to concerns raised by the NJ Pinelands Commission and other agencies, an Interagency Technical Workgroup with representation from the Department, USEPA Region II, and USGS was formed to address these concerns. The workgroup developed the following guidelines for station location selection and interpreting macroinvertebrate data when using the protocol and scoring system:

1. The current scoring system and protocol are not to be applied to the NJ Pinelands Area because of the unique nature of the low pH adapted organisms within these waters (i.e., PL designated surface waters as per N.J.A.C. 7:9B). These waters include both

- “Preservation” and “Protection” areas within the Pinelands, the Mullica and Great Egg Harbor River watersheds as well as the eastern portions of some Delaware tributaries.
2. Monitoring sites must be located at points that represent the downstream terminus of a catchment area of 6 sq. mi. or greater;
 3. Sites should not be located within 500 feet of a lake or impoundment outlet; and
 4. Sites should be sampled between April and November, inclusive;
 5. Sampling should avoid periods when extensive drought has induced unusually low flow conditions.

When the aquatic life use attainment decision is based on biological data alone (no water chemistry data available), the pollutant will be identified on Sublist 5 as “pollutant unknown”.

Fin Fish Assessment - Fish Index Of Biotic Integrity (IBI). Beginning with this 2006 Integrated Report, the Fish Index of Biotic Integrity (IBI) data based upon finfish populations will be used in concert with benthic macroinvertebrate data to assess the aquatic life designated use attainment at selected sites in rivers and streams. The web site for the Department’s Bureau of Freshwater and Biological Monitoring (BFBM) provides the following description of the IBI program:

“...the BFBM began to supplement benthic macroinvertebrate monitoring with an index of biotic integrity (IBI) during the summer of 2000. An IBI is an index that measures the health of a stream based on multiple attributes of the resident fish assemblage. Each site sampled is scored based on its deviation from reference conditions (i.e., what would be found in a non-impacted stream) and classified as poor, fair, good or excellent. The current IBI measures the following metrics:

1. total number of fish species
2. number of benthic insectivorous species
3. number of trout and/or sunfish species
4. number of intolerant species
5. proportion of individuals as white suckers
6. proportion of individuals as generalists
7. proportion of individuals as insectivorous cyprinids
8. proportion of individuals as trout or proportion of individuals as piscivores (top carnivores)- excluding American Eel
9. number of individuals in the sample
10. proportion individuals with disease or anomalies (excluding blackspot disease).”

Streams sampled are currently limited to those of 5 square miles of drainage area or greater. Segments selected for sampling must have a minimum of one riffle, run, and pool habitat to be considered representative. Additional details can be viewed at <http://www.state.nj.us/dep/wmm/bfbm/download/ibi2002Vol2complete.pdf>

The current IBI is only applicable to streams in northern New Jersey, specifically those waters confined to the Highlands, Ridge and Valley, and Piedmont physiographic provinces. The Bureau of Freshwater Fisheries is near completion of an IBI applicable to the Coastal Plain streams in southern New Jersey, thereby completing statewide spatial coverage for the IBI. Additional information on the IBI can be obtained at the BWBM website at [NJDEP-BFBM, Fish Index of Biotic Integrity](#)

Based upon a detailed review of a suite of biological indicators available to the Department (macroinvertebrates, fish IBI and periphyton indicators) performed by the Philadelphia Academy of Natural Sciences and their subsequent recommendations, the Department is planning to upgrade the robustness of the fish IBI calibrated for the northern portion of the state. As a result, the Department will employ the IBI initially on a limited basis in this 2006 assessment. The state will rely on IBI assessments of “poor” as an indicator of impaired fish community while IBI assessments of “excellent” and “good” are considered reflective of a non-impaired community. IBI assessments of “fair” will not be employed until the indicator can be further refined. Locations assessed as “fair” will, instead, be assessed solely on the basis of the macroinvertebrate assessments which are co-located with all IBI monitoring locations.

When available, the Department will evaluate both fish and macroinvertebrates when determining the presence of biological impairment. This means that an assessment of impaired biological status in either indicator alone may lead to a use attainment decision of “impaired” from the bio-indicator perspective for that location. For sites assessed by both indicators, to have nonimpaired status from the bio-indicator perspective, both indicators must reflect a non-impaired condition.

Lake Biological Assessments. The Department does not have a standardized biological indicator for lakes and relies upon program specific assessments provided by the Bureau of Freshwater Fisheries for a selected group of FW lakes. PL lakes contained in the Rancocas and Mullica River drainages are assessed by the Department using biological data collected by the New Jersey Pinelands Commission using a suite of biological indicators employed by the Commission to assess Pinelands waters. Assessment methods for each program are described in detail in section 4.1.3.

4.1.1 Aquatic Life Designated Use Assessment in Non Tidal Rivers

A. FW Non Trout Waters

The methodology for assessing the aquatic life designated use in rivers classified as Non Trout waters is outlined in Table 4.1.1a below.

Table 4.1.1a: Assessment of FW Non Trout Waters

Biological Data Available, No Chemical/Physical Data Available	
Biomonitoring shows no impairment	Full Support
Biomonitoring indicates impairment	No Support and listed as “pollutant unknown”

Both Biological and Chemical/Physical Data Available for Assessment	
Both Biomonitoring and Chemical data show no impairment	Full Support
Biomonitoring indicates impairment AND chemical/physical data show violations of relevant criteria	Waterbody is in nonsupport and listed by the constituent in violation
Biomonitoring indicates impairment BUT chemical/physical data show no observable violations of relevant criteria	Waterbody is in nonsupport and listed as “pollutant unknown”
Biomonitoring indicates non impairment BUT chemical/physical data show violations of relevant criteria	The Department will use BPJ to evaluate the weight of evidence and decide on a case by case basis.

Biological Data Not Available, Only Chemical/Physical Data Available¹	
Minimum dataset unavailable	Insufficient Data
Minimum dataset available; no violations of relevant criteria observed	Full Support
Minimum dataset available; violations observed of relevant criteria	Waterbody listed to be in nonsupport for the constituent(s) in violation
¹ Note: A minimum dataset is required for an AL Assessment in this situation. Constituents of a minimum dataset are pH, DO, temperature, total phosphorus, TDS, TSS.	

B. FW Trout Production and Trout Maintenance Waters

Aquatic Life Use assessments in Trout Production and Trout Maintenance waters are based upon biological assessments supplemented with instream dissolved oxygen (DO) and temperature data compared to trout water criteria. If available data do not meet the minimum data required for trout waters, the sites is assessed as having insufficient data.

Assessment methods are summarized on Table 4.1.1b below. As with non trout waters, biological assessments can be comprised of benthic macroinvertebrate data alone or macroinvertebrates in concert with fish IBI data. If biological monitoring in concert with dissolved oxygen and stream temperature data show nonimpaired conditions, violations of other chemical parameters will be evaluated by “weight of evidence.”

Table 4.1.1b: Assessment of Trout Production and Trout Maintenance Waters

Minimum dataset unavailable ¹	Insufficient Data
Biological monitoring indicates non-impairment AND temperature and DO data meet relevant trout water criteria (see note below)	Full Support
Biological monitoring indicates non-impairment AND temperature and/or DO indicate violations of relevant trout water criteria	Waterbody is in nonsupport and listed by the constituent(s) in violation
Biological monitoring indicates impairment and violations are observed for trout water criteria for DO and/or temperature as well as possibly other water quality constituents	Waterbody is in nonsupport and listed by the constituent in violation
Biological monitoring indicates impairment and no violations are observed for trout water criteria for DO and/or temperature as well as possibly other water quality constituents	Waterbody is in nonsupport and listed as “ipollutant unknown”
¹ Minimum Data Requirements: In-stream Biological Data, Dissolved Oxygen and Temperature	

C. Pinelands (PL) Waters

In the past, the Department had placed benthic macroinvertebrate assessments for PL streams on Sublist 3 (Insufficient Data) because the state-wide protocols were not appropriate for these waters due to their unique nature. The Pinelands Commission (Commission) has developed extensive biological assessments which the Department has used to assess the Aquatic Life Designated Use attainment for selected wadable streams in the Rancocas and Mullica watersheds (Watershed Management Areas 19 and 14, respectively). These assessments are based on extensive studies performed by the Commission of stream vegetation, finfish, and anuran assemblages along anthropogenic disturbance gradients. For the Mullica drainage (Zampella, R.A., et al. 2001, and written communication) all three assemblages were employed. For the Rancocas drainage (Zampella, R.A., et al. 2003), stream vegetation and finfish were used in lakes and streams and anuran assemblage studies were used only in lakes.

Assessments of full attainment and non attainment were established when the Commission's biological data delineated which sites represented clearly background (undisturbed) or clearly disturbed situations respectively; in other words, the Department's assessments came from the two non-ambiguous ends of the disturbance gradient. Sites lying within the more central portions of the disturbance gradient were assessed as having insufficient data and will await additional indicators or protocols to ascertain their Aquatic

Life Support status. Use of this database has allowed the Department to reassess sites in the Mullica and Rancocas drainages and move some sites from Sublist 3 to 1 or 5.

The Department is working with USEPA Region II to develop a biological indicator for PL waters based upon benthic macroinvertebrates, using methodologies similar to what are currently employed in the FW classified portion of the Coastal Plain in New Jersey. Results are promising and a methodology is expected to be in use soon and provide assessments for the 2008 Integrated List.

Table 4.1.1c. Aquatic Life Designated Use Assessment Method for PL Streams	
PL Biological Assessment Status	Result
All biological indicators located in highest quintile range or all but one biological indicator located in highest quintile range and remaining indicator in second to highest range.	Full Attainment
All biological indicators located in lowest quintile range or all but one biological indicator located in lowest quintile range and remaining indicator in second to lowest range.	Non Attainment
Biological indicators not as above, assessments tending to lie within the middle quintile ranges.	Insufficient Data

Note that if instream physical/chemical data are available and violations of aquatic life based criteria are found accompanying observations of impaired biota, the assessment unit will be listed to be in nonsupport and listed by the parameter in violation. Likewise, if only biota is impaired, the assessment will be listed as “impaired – pollutant unknown”.

4.1.2 Aquatic Life Assessment in Freshwater Lakes

Assessment methods for both FW and PL lakes are delineated below.

FW Lakes

Fish populations are sampled by the Department’s Bureau of Freshwater Fisheries using methods such as electrofishing, shoreline seining, and/or gillnetting. Population assessments are then performed by experienced fishery biologists to determine the lake’s actual or potential recreational value as a fishery. These assessments are based upon the diversity of a wide range of fish species and not just of species possessing recreational value. Species stocked by the Department are also identified and addressed in these assessments. As with Trout Production (TP) and Trout Maintenance (TM) streams, Trout Production and Trout Maintenance lakes require an additional data set of in-lake temperature and DO in order to perform an adequate AL assessment. TP and TM lakes

which lack these required datasets will be placed on Sublist 3 until the necessary datasets are collected and assessed. The aquatic life designated use assessment methods for FW lakes are outlined in Table 4.1.2a.

Table 4.1.2a: Aquatic Life Designated Uses Assessment Method for FW Lakes

Aquatic Life Designated Uses Assessment Methods	Result
Fishery is well balanced, exhibiting good diversity. Consistent recruitment.* No one species dominates the community. No observable factors limiting the fishery.	Full Attainment
Threatened Waters**: Fully supported fishery, however, anticipated changes in surrounding land use, lake water levels or in-lake water quality (all being consequences of human activities and not simply natural processes) have the potential to cause future declines in fishery quality.	Non Attainment /Pollutant Unknown
Fishery assessments incomplete or insufficient to assess fishery status	Insufficient Data
Fisheries present, however, fish diversity not at potential expected for the type of lake in question due to anthropogenic activities and not natural conditions. Predators to prey populations are not in balance, inconsistent recruitment*.	Non Attainment /Pollutant Unknown
Fishery exhibits poor diversity as a consequence of anthropogenic activities and not natural conditions. Fishery dominated by a few tolerant species (carp, goldfish, mudminnows, killifish, etc) and/or general overall number of individuals is low. Poor recruitment* and growth of individuals.	Non Attainment/Pollutant Unknown
<p>*<i>Recruitment</i> refers to the number of young fish, which survive to ultimately become large enough to reproduce and/or become harvestable. For example: reproduction of a number species of fish in a lake may be good but there may be insufficient habitat cover resulting in many of these fish being eaten by their larger counterparts before they grow to sufficient size to either reproduce or be sought after by anglers. In such a scenario, recruitment is regarded as poor.</p> <p>**Note that because of the nature of the information that form the basis of the “<i>Threatened</i>” category as it applies to lake aquatic life assessments, the strict 2-year window applied to conventional parameters is not applied here. “<i>Threatened</i>” status here operates within a broader time window, which could encompass a period of, for example, 5 years.</p>	

PL Lakes

As with Pineland streams, the Department has used the Pinelands Commission’s extensive biological database to assess the Aquatic Life Designated Use for selected lakes in the Rancocas and Mullica watersheds (Watershed Management Areas 19 and 14, respectively). These assessments are based on extensive studies performed by the Commission of lake finfish and anuran assemblages along anthropogenic disturbance gradients. Fish and anuran data employed for the Mullica assessments are taken from Zampella, R.A., et al.

2001 and written communication; biological assessments for the Rancocas are taken from Zampella, R.A., et al. 2003, and written communication.

Assessments of full attainment and non attainment were established when the Commission's bioassessment delineated sites which represented clearly background or clearly disturbed situations respectively; in other words, the assessments came from the two non-ambiguous ends of the disturbance gradient. Sites lying within the more central portions of the disturbance gradient were assessed as having insufficient data and will await additional indicators or protocols to ascertain their Aquatic Life Support status.

Table 4.1.2b. Aquatic Life Designated Use Assessment Method for PL Lakes	
Pinelands Biological Assessment Status	Result
All biological indicators located in highest quintile range or all but one biological indicator located in highest quintile range and remaining indicator in second to highest range.	Full Attainment
All biological indicators located in lowest quintile range or all but one biological indicator located in lowest quintile range and remaining indicator in second to lowest range.	Non Attainment- Pollutant unknown
Biological indicators not as above, assessments tending to lie within the middle quintile ranges.	Insufficient Data
Note that if in-lake physical/chemical data are available and violations of aquatic life based criteria are found accompanying observations of impaired biota, the lake will be listed to be in nonsupport and listed by the parameter in violation.	

4.1.3 Aquatic Life Assessment in Tidal Waters

For this discussion, tidal waters include tidal rivers, estuaries and nearshore ocean waters. These waters are critical to New Jersey for tourism and for recreational and commercial fisheries. These waters are also impacted by river discharge from one of the most densely populated watersheds in the country as well as numerous wastewater discharges from coastal communities. Understanding the impact to the coastal ecosystem of these pollutant sources relative to impacts such as ocean upwelling and global warming is critical.

One of the primary uses to be assessed is the ability of the water to support healthy, natural communities of biota. While there are biological tools available to make this assessment for the State's fresh waters, no comparable tool for biological assessment has been developed by the Department for tidal waters. The Department has based its measure of the ecological health of its coastal waters solely on dissolved oxygen measurements. For the

State's ocean waters, no index of benthic (or pelagic) community structure is generally recognized. Research is needed to establish an appropriate index for New Jersey's nearshore ocean waters. For estuarine waters, a couple of benthic indices exist that could be applied. However, these indices must be evaluated to establish which one would be most appropriate for New Jersey estuarine waters. . If these tools existed, it would aid the Department in accurately assessing where impairments exist and in targeting resources to address such impairments. The Department is working toward identifying an indicator of ecosystem health for the benthic community in the estuarine and nearshore ocean waters of New Jersey. Achieving this goal will require the completion of three objectives. The first is to compile existing data on benthic communities in the nearshore ocean waters and estuaries of New Jersey and to identify any data needs. The second is to collect any data necessary to fill the data needs. Third is to assess these data in order to establish a valid benthic index for these waters.

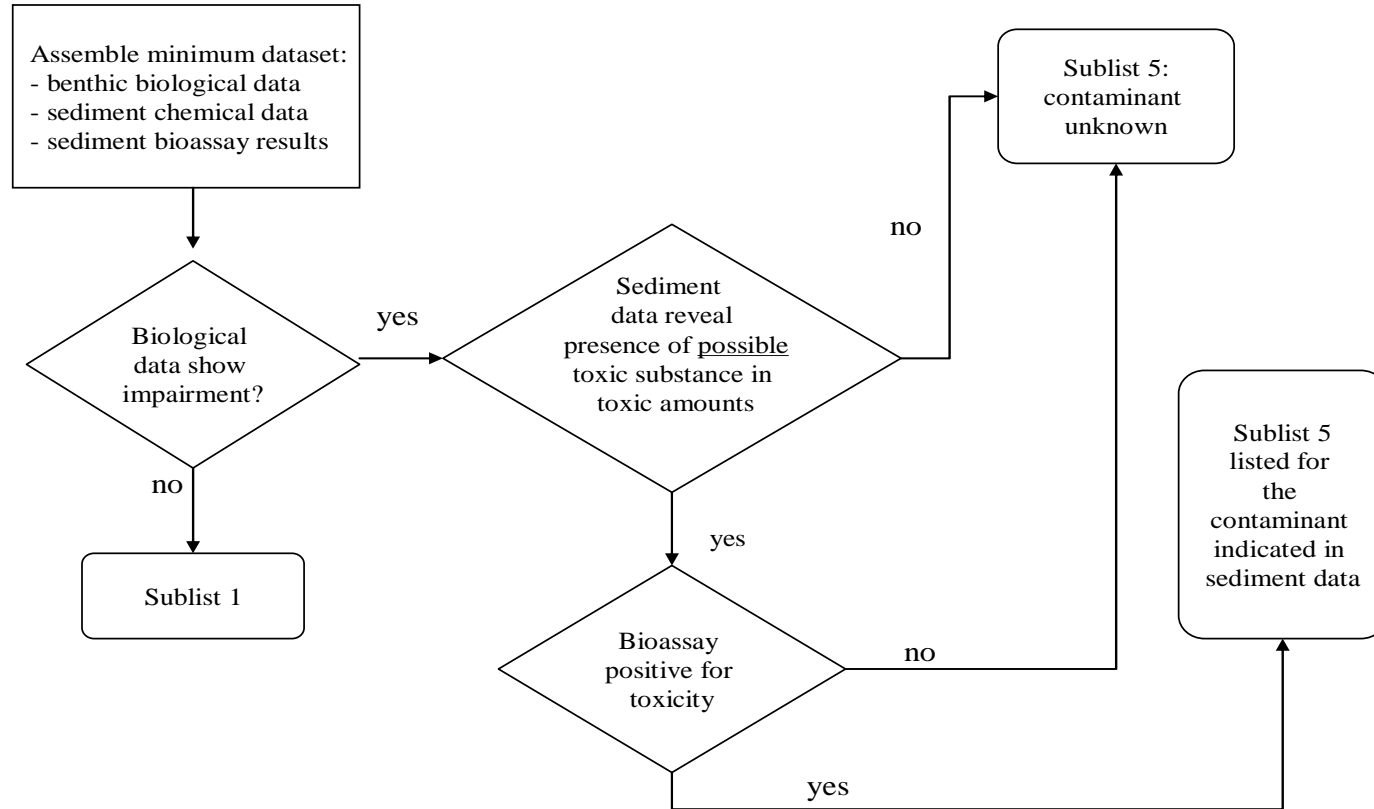
EPA's National Coastal Assessment (NCA) program is providing the states with the first complete and consistent dataset on the condition of benthic communities in the nation's estuarine waters (including some tidal rivers). In order to use these data in assessments for the Integrated Report, the Department assembled a workgroup with participants from USEPA Region 2, USEPA Office of Research and Development, Rutgers University, and the Department to research existing benthic indices and review available data to determine if an appropriate biological index was available. The workgroup identified the Benthic Index of Biotic Integrity developed for the New York/New Jersey Harbor (Weisberg, 1998) as an appropriate indicator for the harbor area. As a result, the Department will use this assessment of benthic community in the 2006 Integrated Assessment for one of its estuaries (NY-NJ Harbor). The Department would also like to extend ecosystem-based assessment to the nearshore ocean waters of the State as well. The Department will continue to evaluate existing estuarine data and develop additional biological indices for the remaining estuarine waters for use in future Integrated Reports.

New York/New Jersey Harbor Area

The Benthic Index of Biotic Integrity developed for the New York/New Jersey Harbor based on EMAP data will be used to assess the waters of Raritan Bay, the Arthur Kill and the Kill van Kull. (<http://www.epa.gov/emap/remap/html/docs/nynjsedappl.pdf>) The assessment methods for these waters are outline in Figure 4.1.3 below.

Figure 4.1.3

AQUATIC LIFE DESIGNATED USE IN THE NY/NJ HARBOR ESTUARY



Tidal Rivers and Estuaries (except NY/NJ Harbor)

Dissolved oxygen (DO) is necessary for most aquatic life forms and monitoring data for DO in tidal waters is readily available through existing monitoring networks. In contrast to surface DO levels, the EPA monitoring has found benthic low DO conditions off the New Jersey coast for most of its length during the quiescent periods of the summer and early fall. These are brought about by thermal stratification that establishes during this period. Storms and the onset of autumn bring about surface to bottom mixing resulting in a breakup of these low DO conditions until the onset of warmer temperatures again in June. The impacts to benthic aquatic life and the possible anthropogenic contributions to these benthic conditions are currently unknown. However, until such time as a biological indicator is identified, DO status is used as an indirect indicator for tidal water aquatic life designated use assessment. The assessment and listing methodology for DO are summarized on Table 5.2 for conventional parameters.

4.2 Recreational Designated Use Assessment (Human Health and Aesthetic Quality)

The Recreational Designated Use Assessment evaluates both human health and aesthetic impacts on recreational use of the waterbody. The SWQS identify two levels of recreation – primary and secondary. Primary recreation includes those water related recreational activities that involve significant ingestion risks and includes, but is not limited to, wading, swimming, diving, surfing, and water skiing. Secondary Contact Recreation is defined as recreational activities where the probability of water ingestion is minimal and includes, but is not limited to, boating and fishing. Primary Contact Designated Use applies to SC, SE1, PL, FW2 and FW1 waters. Secondary Contact Designated Use applies to SC, SE1, SE2, SE3, PL, FW2 and FW1 waters. It is presumed that a waterbody which meets the requirements for Primary Contact is attaining for the less stringent Secondary Contact.

4.2.1 Recreational Designated Use Attainment (Human Health)

The Department is proposing to amend the criteria for bacterial indicators as required by the USEPA in accordance with the Beaches Environmental Assessment and Coastal Health (BEACH) Act of 2000. The BEACH Act amended the Clean Water Act to require each state with Coastal Recreation waters to adopt water quality criteria for pathogen indicators. The criteria should be at least as stringent as those outlined in “EPA’s *Ambient Water Quality Criteria for Bacteria-1986*” (EPA 440/5-84-002), published by USEPA. The Department is proposing changes to the criteria in FW 2 and PL waters based on new scientific information and the USEPA’s recently adopted amendments to 40 CFR 131 for Coastal and Great Lakes Recreation Waters (Water Quality Standards for Coastal and Great Lakes Recreational Waters; Final rule. 69 FR 67218, November, 16, 2004).

The Department is proposing to delete the fecal coliform criteria for the primary contact recreation in all waters. Historically, fecal coliform had been the preferred indicator of fecal matter in ambient water by the USEPA and the Department. However, USEPA no longer

supports the use of fecal coliform as a reliable indicator of human illness risk from full body contact recreation. The USEPA now recommends the use of *E. coli* and enterococcus as pathogen indicators for fresh waters and enterococcus for marine waters (USEPA's draft *Implementation Guidance for Ambient Water Quality Criteria for Bacteria*, November 2003). The Department is proposing to replace the existing fecal coliform criteria for those waters designated for primary contact recreation (such as FW2, SE1 and SC classifications), with either enterococcus or *E. coli* indicators. The Department will use the indicator organism adopted at the time the Integrated List is developed.

Primary and secondary contact recreation areas. According to the existing SWQS, fecal coliform and enterococcus are the pathogen indicators for all waters. Human health issues are addressed by the comparison of pathogenic indicator data to numeric criteria. Waterbodies in general are assessed by comparing the geometric mean of the water quality data to the appropriate SWQS for pathogenic indicators as outlined in Section 5.2.

Designated Bathing Beaches. "Designated bathing beaches" include any coastal beaches that are heavily used for primary contact recreation such as swimming, bathing, and surfing during the recreational season pursuant to the New Jersey State Sanitary Code N.J.A.C. 8:26. When determining the spatial extent for assessments and TMDL development, a designated bathing beach represents an area within 1,500 feet from the shoreline in the saline coastal waters or SC waters and a spatial extent of 200 feet from the shoreline in saline estuarine waters or SE1 waters.

The Department of Health and Senior Services regulates public recreational bathing beaches under Chapter IX of the State Sanitary Code N.J.A.C. 8:26 Public Recreational Bathing. The Department has a Cooperative Coastal Monitoring Program in which various agencies perform sanitary surveys and monitor concentrations of bacteria in near-shore coastal and estuarine waters and determine if and when a bathing beach should be closed. All waterbodies in this assessment are accessible to the public and are designated bathing areas with lifeguards. This assessment method uses the duration and frequency of days for which an individual beach is closed. When there are no beach closures of 7 or more consecutive days in any year or the average number of beach closures is less than 2 per year over a five year period, the beach is assessed as attaining the designated use. Complete closure procedures are outlined in N.J.A.C. 8:26-8.8. (<http://www.state.nj.us/health/eoh/phss/recbathing.pdf>). One beach closure per year of 7 or more consecutive days or an average of 2 or more beach closures per year over a five year period will identify the beach as potentially non-attaining the designated use. The Department will review the closure data to ascertain if these closures were transient anomalies, laboratory error or due to other than water quality issues. The Recreation Designated Use assessment method is outlined in table 4.2.1 below.

Table 4.2.1: Recreational Designated Use (Human Health) Assessment Method

Assessment	Result (see note below)
Beach closure data show violations or geometric mean does not meet SWQS	Non Attainment
Beach closure data does not result in violations and the geometric mean meets SWQS.	Full Attainment

NOTE: In assessment units where bathing beaches play a minor role or where several bathing beaches are fully attaining and only one is not, the Department will look at the water quality of the non bathing beach areas and the frequency and duration of the violations on the one beach before determining the attainment status of the entire waterbody. In those instances where the Department uses BPJ and determines that the non-attaining area is de minimis, the individual beach will be listed on the List of “Waters of Concern.” In order for the area to be considered de minimis, it must contain less than 10% of the area of the waterbody.

4.2.2 Recreational Designated Use Attainment (Aesthetic Quality in Lakes)

The aesthetic quality of lakes is an important aspect in the maintenance of recreational uses since swimming and boating uses may be impaired by nuisance algal growth and sedimentation due to eutrophication. Recreational use support is also assessed from a sanitary perspective in Section 4.2.1. Many of the lakes in New Jersey are constructed impoundments and highly prone to eutrophication. Eutrophication occurs naturally as lakes age, however, this process can accelerate from excessive inputs of nutrients and suspended sediments from surrounding watersheds. Eutrophic lakes are characterized by excessive growth of aquatic weeds and algae, and shallow depths as sediments fill the lake. Severely eutrophic lakes may experience elevated temperatures and low dissolved oxygen.

In past, the majority of lakes were placed on the state’s 303(d) List based upon a series of reports developed under a series of lake monitoring programs. The principal concern in these lakes was their decline in the recreational value as a consequence of eutrophication. Lake impairment issues were brought to the Department’s attention principally through four reporting avenues:

1. New Jersey Lake Management Program Reports;
2. Clean Lakes Program Phase I Diagnostic Studies;
3. Lake Water Quality Assessment Reports; and
4. Lake Intensive Surveys performed prior to 1980.

These programs are no longer in place and have been replaced with a new lake monitoring initiative. In addition, for the purposes of listing on 303(d), lakes are now more closely scrutinized for use impairment than were lakes in the past. Previously listed lakes may be listed under the heading “Lake Aesthetics.” This impairment category is no longer used. Instead, lakes will be listed based upon a specific use impairments such as primary contact and/or Aquatic Life, and listed with a pollutant of concern, if known.

With regards to integrated listing and section 303(d), it is the Department’s current policy that lakes assessed as eutrophic are not automatically assumed to be use impaired. As stated in the previous paragraph, the Department prefers to list eutrophic lakes based upon documented recreational use impairments due to the consequences of eutrophication. Towards this end, the Department is exploring methods to obtain accurate use support status on public lakes, however, due to the current paucity of such data, the Department currently unable to assess the impacts of eutrophication upon recreational use for the purposes of 303(d) listing.

The Department regularly reviews information that documents restoration efforts for impaired lakes that have been previously listed on 303(d). If the information shows that the recreational uses have been restored, the lake will be re-assessed as fully meeting its recreational use. In addition, if a previously assessed lake is investigated and there is no evidence of use impairment, the lake will be delisted. For lakes in which the recreational use status was assessed as “status not determined”, the Department will evaluate any new information as it becomes available, to determine its attainment status.

Although many of the lakes currently on the State’s 303(d) List were listed based upon assessments that may be twenty years old, the condition of the lake (with regards to recreational non support) is considered the same as that delineated in the original assessment. This rationale is based on the observation that unless a remedial action has taken place on an impaired lake, its condition (in regards to use impairment), through natural lake succession, is not expected to improve through time.

4.3 Fish Consumption Designated Use Assessment

Fish consumption designated use assessments are based on the presence of fish consumption advisories or bans. The data collection, risk assessment and the issuance of fish consumption advisories and bans are overseen by the New Jersey Interagency Toxics in Biota Committee (ITBC). Through the ITBC, a joint effort between the Department and the NJ Department of Health and Senior Services, research projects are coordinated to monitor levels of contaminants in commercially and recreationally harvested fish, shellfish and crustacean species. Edible portions of individual animals are tested for one or more bioaccumulative chemicals (e.g., PCB’s, chlorinated pesticides, dioxins, and mercury). These data are evaluated for development of consumption advisories and bans, as appropriate, to protect human health.

The Department followed the USEPA's "Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories – Volume II Risk Assessment and Fish Consumption Limits" (USEPA 2000) for establishing PCB advisories. For mercury consumption advisories, the ITBC used health risk-based mercury guidelines established by the NJDEP (NJDEP, 1994) which follow closely guidelines recommended by the Year 2000 National Research Council report - *Toxicological Effects of Methylmercury*. For dioxin, New Jersey currently uses an FDA advisory opinion issued in 1981 (see FDA. 1981 and FDA. 1983). The methodology for determining the assessment status for fish consumption is outlined in table 4.3 below.

Table 4.3: Fish Consumption Designated Use Assessment Method

Assessment	Result
No fish restrictions or bans in effect	Full Attainment
"Restricted Consumption" of fish in effect (restricted consumption defined as limits on the number of meals or size of meals consumed per unit time for one or more fish species); or a fishing ban is in effect for a sub-population that could be at potentially greater risk for one or more fish species or included on 1998 Impaired Waterbodies List and no new data available.	Non Attainment
"No consumption", or fishing ban in effect for general population for one or more fish species; or commercial fishing ban in effect.	Non Attainment
Fish tissue data not available	Unassessed
Statewide advisory based on extrapolated data	Insufficient Data

4.4 Shellfish Harvesting Designated Use Assessment Method

Shellfish harvesting designated use is applicable in all waters classified as SC and SE 1 in the SWQS. Shellfish harvest classifications are based on the National Shellfish Sanitation Program (NSSP) requirements (NOAA, 1997). This program is overseen by the federal Food and Drug Administration to ensure the safe harvest and sale of shellfish. The adopted shellfish harvesting classifications are included in the NJ SWQS by reference in N.J.A.C. 7:9B-1.12(g). Based on sampling data and assessment procedures in the NSSP manual, waters are classified for unrestricted harvest, special restricted, seasonal or prohibited. Prohibited, special restricted, and seasonal areas are further separated into waters where shellfish harvest is prohibited due to poor water quality or administrative closures based on land use, resource availability or sanitary surveys.

Administrative closures are established in areas around potential pollution sources, such as sewage outfalls and marinas. These areas are closed as a preventive measure to protect shellfish from contamination in areas immediately adjacent to the 15 sewage outfalls in the ocean and from an emergency such as a sewage bypass or a break in an outfall pipe. In marinas, prohibited areas are established to protect human health from contamination from

boat wastes and runoff. Where closings are based on land use (i.e., marinas, STP outfalls, etc.), these areas are identified as attaining. This assessment methodology (Table 4.4) is consistent with the USEPA's guidance on the use of shellfish classifications in 303(d) decisions which states that waters classified "Prohibited" due to administrative closures should not be classified as impaired if data are not available to document an impairment. (USEPA, 2000). USEPA guidance for the 2006 Integrated Report (USEPA, 2005) states that non-attainment of fishable waters is demonstrated when the advisory is based on shellfish tissue or a lower than 'Approved' classification is based on water column and/or shellfish tissue data.

Table 4.4: Shellfish Harvesting Designated Use Assessment Method

NSSP Classification	Result (See note below)
Approved	Full Attainment
Prohibited/Administrative Closure	Full Attainment
Prohibited, Special Restricted or Seasonal classifications based on water quality	Non attainment

NOTE: Shellfish classification boundaries were used in past reporting as waterbody assessment units. However, they change annually with each update of the shellfish growing areas as required by the NSSP. Using shellfish classification boundaries requires establishing new waterbodies every assessment cycle, making it difficult to track waterbodies from cycle to cycle and impossible to assess trends. The use of the new assessment units allows the Department to both track waterbodies over cycles and assess trends. However, the use of HUC boundaries do not reflect the shellfish classification boundaries and will, in many instances, contain more than one classification. In most instances, the attainment status for the assessment unit will reflect the worst classification found within the HUC boundary. In the few instances where only a de minimus portion of the acreage within the HUC has less than approved classification, the assessment will reflect the assessment of the non-de minimus area (i.e., the assessment unit contains 30 acres of which 2 acres are seasonally approved and 28 acres are fully opened based on data from 12 stations, the HUC would be assessed as full attainment). Any de minimus areas which are not fully approved and are not subject to administrative closures will be discussed in the 305(b) Report along with actions being taken. The use of HUC assessment units will, overall, exaggerate the extent of impairments. The official adopted Shellfish Classification maps should be referenced for determining exact locations for TMDL development

4.5 Drinking Water Supply Designated Use Assessment Method

Drinking water designated use is defined as waters that are potable after conventional filtration treatment and disinfection, and do not have consistent removal issues for chemical constituents. Drinking water designated uses apply to surface waters classified as Pinelands (PL) and Freshwater Category 2 (FW2). It is important to note that many waterbodies do not have drinking water intakes due to stream size and other considerations. The parameters which may be used to assess drinking water use are: arsenic, cadmium, chromium, copper, cyanide, lead, mercury, thallium, zinc, nitrate, TDS and chloride. These parameters are included in the USGS/NJDEP monitoring program, the primary source for much of the available data, however, other metal and organic data with human health criteria will be included if sufficient data are available.

In addition to the chemical parameters, the Department uses monitoring data from treated or finished water supplies to determine compliance with the Safe Drinking Water Act's National Primary Drinking Water Regulations (NPDWRs or primary standards) and water supply use restrictions. Pollutants monitored for the protection of human health under the primary standards include volatile organic compounds, semi-volatile organic compounds, inorganic constituents, salinity, radioactive constituents, and disinfection by-products. Use restrictions include closure, contamination based drinking water supply advisories, better than conventional treatment requirements and increased monitoring requirements due to confirmed detection of one or more pollutants.

The Department's Bureau of Safe Drinking Water summarizes Safe Drinking Water Violations annually. The Drinking Water Designated Use assessment method uses the data provided in these reports. Only those violations which can be attributed to surface water sources are considered. Violations for copper and lead which could be attributed to the collection system are not used for assessing source water unless the violations occur in the ambient waters. This assessment method is explained in Table 4.5 below. The assessment of nitrate and TDS, as an indicator for drinking water designated use, follows the assessment method for conventional water quality parameters explained in Section 5.2. Metals and organics follow the assessment method for toxic water quality parameters explained in Section 5.3 .

Table 4.5: Drinking Water Designated Use Assessment Method

Safe Drinking Water Actions	Result
No closures or use restrictions or water quality violations	Full Attainment
Closure or water quality violations	Non Attainment
Surface water quality is such that more than conventional treatment is required	Non Attainment
Contamination based drinking water supply advisories	Insufficient Data
Increased monitoring requirements due to confirmed detection of one or more pollutants	Insufficient Data

4.6 Industrial Water Supply Designated Use Assessment Method

Industrial water supply designated use assessment assesses waters used for processing or cooling. The SWQS do not have criteria specific to industrial use. If the waterbody meets the Drinking Water Use, it is presumed to meet the Industrial Water Use. If the drinking water use is Non Attaining for a human health criteria, the Department will use total suspended solids (TSS) and pH, a measure of acidity, as indicators for industrial water supply use. A pH range of 5 to 9 will be used to assess attainment. The assessment methodology for industrial water supply designated use follows the assessment methods outlined in Section 5 for conventional parameters in Table 5.2.

4.7 Agricultural Water Supply Designated Use Assessment Method

The agricultural use of surface water includes irrigation and livestock farming. This assessment applies to waters classified as FW2 and PL in the SWQS.

Although the SWQS are applicable to agricultural water use, numeric criteria are not included. The water quality suitable for agriculture is normally less stringent than that needed to protect aquatic life and human health. Therefore, it is presumed that any waterbody which is assessed attaining for Drinking Water Use, is also attaining for Agricultural Use. In order to evaluate water supplies that support agriculture in New Jersey, guidelines are referenced from the U.S. Department of Interior Natural Resources Conservation and other states (Follet, 1999 and Bauder, 1998). These guidelines are used to evaluate whether water supplies support common agricultural uses such as irrigation and livestock raising.

For the assessment, total dissolved solids (TDS) and salinity were selected as indicators of agricultural use. Salinity was chosen due to its adverse and immediate detrimental effects on all agricultural practices. TDS has similar negative effects and also indicates possible

contamination from runoff. The more stringent of the recommended standards for irrigation and livestock is applied in the assessment as the acceptable level to fully support agricultural use. Acceptable levels for total dissolved solids and salinity were established as at or below 2,000 mg/l (Follet, 1999). If TDS or salinity data are not available, specific conductance is used as a surrogate with a specific conductance of 3,000 us/cm approximately equivalent to TDS and salinity levels of 2,000 mg/l (United Nations, 1985). Toxics are also a primary concern for agricultural uses, however, the state's criteria for toxics apply to human health and aquatic life protection which are more stringent than the criteria needed for agricultural use. Several other states have established criteria for agricultural uses and further research will be done to evaluate the feasibility of applying their criteria to our state water quality for agricultural uses.

Note: Crops and livestock may be negatively affected by numerous non-water factors such as type of livestock, crop tolerance, soil type, drainage, irrigation methods and management. Therefore exceedances of these guidelines do not necessarily impair uses for agriculture. On the other hand, concentrations below these limits may restrict agricultural use in certain circumstances. Therefore, the designated use assessment of "non attainment" is applied only when water quality no longer supports existing agricultural water supply uses.

5.0 Use of Physical, Chemical, and Toxicological Data – General Considerations

Data Quality: The Department reviews all existing and readily available data as required and is committed to using only data with acceptable quality to develop the Integrated Report. Information on individual data sources used for development of an Integrated List will be provided in the Integrated Report. In determining which data are appropriate and readily available, the Department will consider quality assurance/ quality control, monitoring design, age of data, accurate sampling location information, data documentation and use of electronic data management.

Quality Assurance: The Department maintains a strong commitment to the collection and use of high quality data to support environmental decisions and regulatory programs. Quality Assurance Project Plans (QAPP) describe the procedures used to collect and analyze samples and to review and verify the results in order to certify high quality data. The Department maintains a policy that an approved QAPP accompany all environmental data collection activities performed by, or for use by, the Department as outlined in both the Department's and the USEPA Region II's approved FY03-FY04 Departmental Quality Management Plan (NJDEP, 2003). The QAPP should be approved by the Department's Office of Quality Assurance prior to the start of any sampling. The Department also published a Field Sampling Procedures Manual that includes approved procedures for sample collection, field quality assurance, sample holding times, and other data considerations (NJDEP, 1992). Use of this manual, or equivalent field procedures as determined by the Department's Office of Quality Assurance, is required in order for the data to be evaluated as part of the Integrated Assessment. Samples must be analyzed at a laboratory certified by the Department's Office of Quality Assurance, or a federal laboratory (e.g., the USGS National Water Quality Laboratory in Denver) using analytical methods or their equivalents as certified by the Department, (N.J.A.C. 7:18), the USEPA, or the USGS.

The QAPPs for all routine ambient monitoring programs operated by the Department are approved annually prior to initiation of sampling and prior to initiating research projects. The Interagency Toxics in Biota Committee (ITBC) reviews data and risk assessment methods used to develop fish consumption advisories. The Site Remediation Program (SRP) requires very extensive quality assurance documentation and QAPPs, which must be approved by the Department or the USEPA, as required. NJ Department of Health and Senior Services (NJDHSS) oversees quality assurance procedures for the monitoring programs conducted by local health authorities (e.g., Lake Beach Monitoring).

All data and information submitted to the Department for consideration in the development of the Integrated Assessment is required to follow the Department's quality assurance guidelines (NJDEP, 2002) and must include a QAPP.

Locational Data: Accurate locational data are particularly important for the Integrated Report. For some parameters (e.g., dissolved oxygen, temperature, and pH), the applicable SWQS criterion depends on specific stream classification areas established by regulation (N.J.A.C.7:9B). In addition, sampling stations must be outside of mixing zones and zones of initial dilution. Accurate locational data are required to ensure comparison to appropriate SWQS criteria, as well as confirming that sampling stations are located outside of regulatory mixing zones. The Department will accept monitoring data if sampling locations are accurate to within 200 feet. Digital spatial data (GIS or GPS) or latitude/longitude information accompanied by USGS Quadrangle maps are acceptable methods of providing locational information. Only sampling data that are spatially referenced will be used to develop the Integrated Report. Location data for all the Department's monitoring stations are recorded utilizing a Global Positioning System.

Electronic Data Management: In general, only electronic data are considered "readily available", due to the significant effort needed to computerize and analyze hard copy data. The Department uses electronic data from the USEPA Storage and Retrieval (STORET) system; the USGS National Water Information System (NWIS), and other special programs (e.g. The USEPA Helicopter Beach Monitoring Program and local monitoring entities.) Typically, the Department uses Microsoft databases (i.e., Excel, Access) for database management and retrieval, however, STORET formatting is encouraged as a standard for data management, exchange and archiving. Additional information on STORET is available at <http://www.epa.gov/STORET>. A user friendly template developed by the Department for data not submitted directly into STORET can be viewed at <http://www.state.nj.us/dep/wmm/sgwqt/wat/datasolicitation.htm>.

Reference Reports: In order to establish a strong technical foundation for the Integrated Report, the Department requests "citable" hard-copy reference reports for each data source. This request ensures that the monitoring entities are responsible for compiling the data, completing a detailed quality assurance review, and addressing questions regarding the dataset. Furthermore, citable reports offer those who review the New Jersey Integrated Report an opportunity for independent evaluation of the underlying data. Written reports are available for most datasets and range from very basic raw data reports (that include a brief description of the monitoring program and tables of raw data) to very thorough peer-reviewed reports. The availability of reports used in developing the Integrated List will be noted in the Integrated Report.

Assessments Based Upon Weight of Evidence: Weighing data is necessary when evaluating numerous data sets that have different data collection and analysis methods, temporal or spatial sampling variability, or direct applicability to the water quality standards. This weighing will be applied in the following situations: newer data has more weight than older data unless past conditions are more representative of current conditions; larger data collection sets have more weight than nominal data sets; direct indicators of designated uses have more weight than surrogate indicators; and, higher quality data is given more weight based on sampling protocol, equipment, training and experience of

samplers, quality control program, lab and analytical procedures. If the Department has the occasion to assess different weights of data, the specific rationale used will be detailed in the Integrated Report.

Data Assessment Method: The Department does not feel that one individual digression from a SWQS over a five year period results in the impairment of the designated use of that waterbody. The Department intends to use 10% as the allowable excursions over a five year period with a minimum of 2 violations before the waterbody is deemed impaired.

Deminimus Impairments: In data rich waterbodies, it would not be an effective manageable policy to assign an assessment unit to each and every station. This is particularly true in the estuaries where shellfish waters are intensely monitored. A tiny cove may not be fully opened, but the main body of the assessment unit is fully approved. The Department will use Best Professional Judgment and look at the magnitude and aerial extent of any violations and determine the attainment status. In order to use BPJ, the non-attaining area must be less than 10% of the assessment unit's acreage. Any areas designated as de minimis will be identified on the List of Waters of Concern.

5.1 Numeric Water Quality Criteria Assessment – General Issues

Numeric water quality criteria are available for conventional parameters (i.e., dissolved oxygen, pH, temperature), toxics (i.e., metals, organics, unionized ammonia, radioactivity), and sanitary quality (i.e., pathogens); see www.state.nj.us/dep/wmm/sgwqt/sgwqt.html. Water quality data are compared to applicable numerical criteria and may be assessed alone or in combination to determine designated use attainment (e.g., pH and TSS data are integrated to evaluate industrial water supply designated uses).

Surface Water Quality Standards Considerations: The following aspects of the applicable numeric water quality criteria (N.J.A.C. 7:9B, the USEPA’s National Toxics Rule and DRBC Water Quality Regulations) are considered in each assessment:

- **Design Flows:** Design flows in the NJ SWQS are defined in N.J.A.C. 7:9B-1.5 and apply to the USEPA’s National Toxics Rule and State criteria as follows:
 - a) carcinogenic effect-based human health criteria, toxic substances with a bioaccumulation or bioconcentration factor greater than 200 Liters/kilogram, and bromodichloromethane, the design flow shall be the flow which is exceeded 75 percent of the time for the appropriate “period of record” as determined by the United States Geological Survey;
 - b) non-carcinogenic effect based criteria: minimum average 30 consecutive day flow with a statistical recurrence interval of 5 years (MA30CD5);
 - c) acute aquatic life protection criteria: minimum average 1-day flow with a statistical recurrence interval of 10 years (MA1CD10);
 - d) chronic aquatic life protection criteria for ammonia, the design flow shall be the minimum average 7-day flow with a statistical recurrence interval of 10 years (MA30CD10); and
 - e) design flow for all other criteria is the minimum average 7-day flow with a statistical recurrence interval of 10 years (MA7CD10).

Ideally, data should be collected when streams are at or above “design flows” in the applicable numeric water quality standard. Since this is not always possible, flow data will be reviewed when violations occur. Data collected at flows below “design flows” will not be used to identify waters as impaired.

- **Frequency of Exceedance:** The Department has established a minimum of 2 exceedances of a SWQS to confirm impaired waters. When there are 2 or more exceedances in a large data set resulting in < 10% of the data in violation, the Department will further evaluate the magnitude, duration and frequency of the violations and other available data to determine whether or not they are minor excursions. For toxics, with the exception of human health carcinogens, the allowable frequency of exceedance is 1 in 3 years. The long term average is used for human health carcinogens (see table 5.3).

- **Magnitude of Exceedance:** The SWQS and the USEPA guidance do not provide methods to consider the magnitude of the exceedance. However, the Department will evaluate the magnitude of an exceedance when exceedances occur in less than 10% of the data..
- **Duration of Exceedance:** The SWQS include duration considerations for average concentrations over 1 hour for acute aquatic life criteria, 4 days for chronic aquatic life, 30 days for non-carcinogens and 70 years for carcinogens. In general, based on the current monitoring protocols (i.e., grab samples) it is not possible to consider the duration of exceedance. Therefore, individual exceedances were considered to extend over the applicable duration, providing a more conservative assessment. However, if violation only occurs under high flow conditions and flow data is available which shows that the high flow condition did not meet the duration, then it would not be listed as non-attaining.
- **Natural Conditions:** Waterbodies that do not meet applicable SWQS criteria potentially due to natural conditions will be carefully evaluated. If the excursions cannot be conclusively attributed to natural conditions, the waterbody will be classified as “non-attainment” providing a conservative analysis. If excursions can be attributed to natural conditions, the natural water quality will be used in place of the criteria, and the elevated levels will not be considered exceedances of the applicable criteria, as per N.J.A.C. 7:9B-1.5. For example, good biological data and low DO below a swamp.
- **Antidegradation Policy:** The policy description and permitting implementation can be reviewed at <http://www.state.nj.us/dep/wmm/sgwqt/2004swqs.doc>
- **Metals, Dissolved vs. Total Recoverable:** Surface Water Quality Standards (SWQS) criteria for metals include human health (HH), acute aquatic life (AQLa), and chronic aquatic life (AQLc). HH criteria are based on the total recoverable (TR) form of the metal to protect human health from all forms of the metals. Most AQL criteria (both acute and chronic) are based on dissolved fraction (DF) form of the metal; exceptions are AQLc only for mercury and AQL acute and chronic for selenium. AQL criteria for cadmium, copper, lead, nickel, silver, and zinc are calculated based on hardness at the time of sampling. The applicable criterion decreases as hardness decreases, due to the increased bio-availability of metals in low hardness waters.

To the extent available, total recoverable (TR) and dissolved fraction (DF) data will be compared to TR and DF criteria, respectively. When only TR data are collected, TR concentrations above the DF criteria will trigger additional sampling for DF data to confirm exceedance of DF criteria.

- **Protocols When The Applicable Criteria Are Below Detection:** In some cases, the applicable criterion lies below the analytical minimum detection limit (MDL) (i.e., concentrations at or below the criterion are not measurable). This occurs

for arsenic (MDL: 1 part per billion (ppb), HH criterion: 0.017 ppb); and mercury (MDL: 0.04 ppb, AQLc criterion: 0.012 ppb). In low hardness waters, AQLc criteria for cadmium, copper and lead will not be measurable in some samples. An exceedance is identified if the ambient metal concentration is above the MDL and thus clearly above the criterion. An exceedance will not be identified if the criterion and metal concentration are both below the MDL (i.e., non detect). In these cases, analyses with lower MDLs will be sought. When a site is currently listed for an AL violation of a metal and the criterion is below the MDL, current data show no detections, and co-located biological data show non impaired conditions, the site will be delisted for the metal in question.

- **Censored Data:** Censored data are data with concentrations that are less than the minimum reporting level of an analytical procedure. These data are usually labeled with a “<” symbol followed by the reporting limit in the data report received from the laboratory. For example, total phosphorus below the minimum reporting level would be “< 0.01 mg/l”. These values are set to one-half of the reporting limit for assessments, so that for the above example, 0.005 mg/l would be used in the assessment of total phosphorus. If the concentration and criteria are both below the minimum reporting level, the data will not be used to make an assessment.. Conversely, values above the maximum detection level are set at the maximum detection level.

In assessing toxic substances against a human health carcinogen criterion, the Department will employ the delta log normal distribution analysis as delineated in the EPA Technical Support Document for Water Quality-based Toxic Control, EPA/505/2-90-100, dated March 1991.

- **Significant Figures:** are the number of reliably known digits used to locate a decimal point reported in a measurement. Proper use of significant figures ensures that the uncertainty of the measurements is correctly represented. When assessing data, the Department will limit the significant figures in data results to that associated with the SWQS being assessed with one exception. The SWQS for total phosphorus is 2 significant places for lakes (0.05) and one significant place for rivers (0.1). Since the analytical methods used and the precision is the same for a sample regardless of which standard applies, the Department will apply 2 significant figures when assessing Total phosphorus data
- **Minimum Data Requirements:** The recommended sampling frequency is at least 8 samples collected at least quarterly for a minimum of 2 years. If data collection does not meet these recommended requirements, then a modified assessment method (see Modified Assessment Method below) may be applied to more limited data sets with a minimum data requirement of at least 4 samples. These data requirements are intended to ensure that existing water quality conditions are accurately portrayed and do not

characterize transitional conditions or use obsolete data. When calculating a geometric mean, the data set should have at least 5 samples collected over a 30 day period.

- **Data Age:** In most cases, the Department will use the most recent 5 years of readily available data. Data more than 5 years old may be used on a case-by-case basis (for example, older data could be used if conditions in the waterbody have not changed, or if the older data are used in conjunction with newer data to demonstrate water quality trends where appropriate analytical methods are used and results can easily be compared with more recent data).
- **Assessments Using Sub-samples:** A sample may consist of many individual samples collected spatially at one station location. When data are collected in a vertical or horizontal cross section, or at several locations within close proximity to each other, the data may be combined and assessed as one sample. The individual “subsamples” are assessed as follows: When comparing data to a “not to exceed at any time” criterion, the sample is represented by the worst case subsample. When comparing the data to a criterion based on an average or geomean, all the individual subsamples would be combined to determine the average or geomean. For example, if data were collected at the surface, mid way and bottom of the water column (DO readings of 3.0, 4.0 and 5.0 mg/l), the average of the 3 subsamples would be 4.0mg/l and the value to compare to the “not to exceed” criterion would be 3.0mg/l.
- **Assessment Based Upon Continuous Monitoring:** Often a sample consists of one unique grab sample - one sample at one location at a station. These grab samples are considered to be representative of the water quality for that day. Other times, a sample consists of many individual subsamples collected temporally at one station location (example- diurnal DO sampling where samples are collected every hour or half hour). The parameters most commonly measured in this fashion are water temperature and dissolved oxygen (DO). The protocol for comparing these data to the criterion is as follows:

Data collected over the long term (i.e., the entire summer season): The lowest value of each 24 hour period will be compared to the “not less than any time” (i.e., DO) or the highest value to a “not to exceed” (i.e., temperature) criterion. For example, if you have hourly DO readings ranging from 6.0 mg/l to 3.0 mg/l, the 3.0 mg/l would be used to represent the 24 hour period. The station will be assessed as in violation if greater than 10 percent of the days violate the criterion for the summer season. When comparing the data to a criterion based on an average or geomean, all the individual subsamples would be combined to determine the average or geomean.

Data collected over a shorter term (at least 72 hours) will be considered to be in violation if two or more sample intervals equaling at least one hour exceed the criterion within the 72 hour period.

- **Assessments Based Upon Limited Datasets (Modified Water Quality Assessment):** A modified assessment method is used for datasets that do not meet the recommended data requirements as outlined for each assessment, but still have value in assessing water quality. Examples of this type of data may include: 1) datasets of less than 8 samples; 2) sampling less than quarterly frequency; or 3) the duration of sampling is less than 2 years. Datasets of these types are evaluated on a case-by-case basis to determine if the data characterize the range of water quality variation that adequately represents conditions of existing water quality. Other examples of data sets that may be assessed by the modified method include: pathogenic indicators data sampled during the swimming months to determine compliance of recreational standards, nutrient data sampled during the growing season to determine eutrophic conditions, or temperature data sampled from late spring to early fall to determine conditions during the warmer months.

If it is determined that data do not adequately represent existing water quality conditions based on these or other possible qualifying factors, the result will be an assessment of “insufficient data.” At least two exceedances are needed to confirm that the water quality does not meet SWQS. Therefore, a single sample is insufficient to determine attainment status. This ensures that even with additional sampling, which would meet the recommended data requirements, the assessment result will not change. The assessment results and the basis and rationale for using the data will be provided in the Integrated Report when the modified water quality assessment is used.

5.2 Assessment Methods Using Conventional Water Quality Parameters and Pathogens

Conventional water quality measurements include parameters such as dissolved oxygen, pH, total phosphorus, total suspended solids, total dissolved solids, sulfate, temperature, chloride, and nitrate. The Department has established the SWQS in a conservative manner so that an occasional digression will not impair aquatic life or human health. The assessment methodology to determine an unacceptable level of exceedances for conventional water quality parameters is outlined in Table 5.2 below. Note that the status of many designated uses (such as Aquatic Life) are based upon a suite of indicators, hence waters in violation of a single parameter may not necessarily be assessed as being in nonsupport of a use. In cases where violations of single parameters do lead to decisions of nonsupport (see section 4.0), then waters assessed as having no water quality violations based upon Table 5.2.1 will be assessed as being in full support whereas sites assessed as having water quality violations will be assessed as being in nonsupport.

Table 5.2.1: Conventional Water Quality Parameters Assessment Method

Water Quality Assessment for Recommended Sampling Protocol	Result
< 2 of samples exceed applicable SWQS or excursions due to natural conditions	Assessed to have no water quality violations
Threatened Waters: Degrading WQ trends indicate SWQS are likely to be exceeded within 2 years	Assessed to have water quality violations
At least two (2) samples exceed applicable SWQS	Assessed to have water quality violations
Modified Water Quality Assessment	
No samples exceed applicable SWQS or excursions due to natural conditions	Assessed to have no water quality violations
One (1) sample exceeds applicable SWQS	Insufficient Data
Data does not adequately represent existing water quality conditions	Insufficient Data
Two (2) or more samples exceed applicable SWQS	Assessed to have water quality violations

Pathogenic Indicators: Assessing recreational designated use in non designated bathing beaches will use the geometric mean of the pathogenic indicator, see section 4.2.1 for bathing beach and overall recreation use assessments.

Table 5.2.2 Pathogenic Indicator Water Quality Parameters Assessment Method

Assessment Method	Result
The geometric mean less than the geometric mean criterion, or excursions were due to natural conditions	No water quality violations
The geometric mean greater than the geometric mean criterion	Assessed to have water quality violations

5.3 Toxic Water Quality Parameters Assessment

Toxic parameters include unionized ammonia, metals, and organics. Organics include current and historical pesticides and volatile organic compounds (VOCs). Unionized ammonia is calculated from total ammonia concentrations using pH and temperature at the time of sampling. Table 5.3, below, summarizes the assessment methodology for toxic parameters. Note that toxic parameters are often used in concert with other datasets to determine designated use attainment. See section 4.1 for details regarding Aquatic Life Use Assessments and section 4.5 for Drinking Water Use assessment.

As stated for Table 5.2, above, in cases where violations of single parameters do lead to decisions of nonsupport, then waters assessed as having no water quality violations based upon Table 5.3 will be assessed as being in full support whereas sites assessed as having water quality violations will be assessed as being in nonsupport.

Table 5.3: Toxic Water Quality Parameters Assessment Method

Assessment Method	Result
Water Quality Assessment for Recommended Sampling Protocol	
Less than or equal to 1 exceedance in 3 years of applicable SWQS criteria; or excursions were due to natural conditions	no water quality violations
Threatened Waters: Less than or equal to 1 exceedance in 3 years of applicable SWQS criteria, but degrading WQ trends indicate SWQS are likely to be exceeded within 2 years	water quality violations
Two (2) or more samples exceeded SWQS criteria Human carcinogens: Average concentration greater than SWQS criteria ¹	water quality violations
Water Quality Assessment for Modified Assessment	
All samples meet SWQS or excursions were due to natural conditions	no water quality violations
One (1) sample exceeded applicable SWQS	Insufficient Data
Data does not adequately represent existing water Quality conditions	Insufficient Data
Two (2) or more samples exceeded SWQS Human carcinogens: Average concentration greater than SWQS criteria ¹	water quality violations
¹ In accordance with the USEPA guidance (USEPA, 2001), the Department may use the mean of the measured ambient concentration compared to the criterion when assessing impairment of a chemical human health criterion based on a long term exposure. If the mean exceeds the criterion, the water quality standard is not being attained. If the mean does not exceed the criterion, the water quality standard is being attained.	

6.0 Narrative Criteria and Policies

Narrative criteria are descriptions of the conditions necessary for a waterbody to attain its designated uses. To implement narrative data, which is qualitative in nature, the Department has identified assessment approaches, also known as “translators”, to quantitatively interpret narrative criteria. New Jersey’s SWQS contain the following narrative criteria:

Toxics:

- **Toxic substances** –“ None, either alone or in combination with other substances, in such concentrations as to affect humans or be detrimental to the natural aquatic biota, produce undesirable aquatic life, or which would render the waters unsuitable for the desired use.” **And**
- “Toxic substances shall not be present in concentrations that cause acute or chronic toxicity to aquatic biota, or bioaccumulate within the organism to concentrations that exert a toxic effect on that organism or render it unfit for human consumption.”

This narrative criteria is supplemented by the Department’s toxics policy:

Toxics policy: “Toxic substances in waters of the State shall not be at levels that are toxic to humans or the aquatic biota, or that bioaccumulate in the aquatic biota so as to render them unfit for human consumption”

In addition to the numeric criteria for individual toxic parameters specified in the SWQS which protect aquatic life as well as human health, the Department uses several translators to assess compliance with the narrative toxic criteria. These translators include: fish consumption advisories (Section 4.3), shellfish closure data (Section 4.4), and drinking water designated use assessments (Section 4.5) with regard to human health, and macroinvertebrate data to assess toxic effects on aquatic life (Section 4.1).

Nutrients: In addition to the numerical water quality criteria for total phosphorus, the SWQS include narrative nutrient policies at N.J.A.C. 7:9B-1.5(g) that apply to all freshwaters of the state. The narrative nutrient policies prohibit nutrient concentrations that cause objectionable algal densities, nuisance aquatic vegetation or render waters unsuitable for designated uses.

Nutrient Criteria:

- **Lakes:** Phosphorus as total P shall not exceed 0.05mg/l in any lake, pond or reservoir, or in a tributary at the point where it enters such bodies of water, except where watershed or site-specific criteria are developed pursuant to N.J.A.C. 7:9B-1.5(g)3.
- **Streams:** Except as necessary to satisfy the more stringent criteria above or where watershed or site-specific criteria are developed pursuant to N.J.A.C 7:9B-1.5(g)3, phosphorus as total P shall not exceed 0.1mg/l in any stream, unless it can be demonstrated that total P is not a limiting nutrient and will not otherwise render the waters unsuitable for the designated uses.

Nutrient Policy: Except as due to natural conditions, nutrients shall not be allowed in concentrations that cause objectionable algal densities, nuisance aquatic vegetation, abnormal diurnal fluctuations in dissolved oxygen or pH, changes to the composition of aquatic ecosystems, or otherwise render the waters unsuitable for the designated uses.

In addition to assessing the numeric criteria for phosphorus, the Department assesses the narrative nutrient policy as explained in Section 4.2.2 under the Recreational Designated Use Assessment- Aesthetics as a translator.

The Department, in alignment with the EPA's recommendation (USEPA 2002), is investigating nutrient criteria based on linking stressors (i.e., total phosphorous, nitrogen) with biological responses (i.e., periphyton diatoms, biomass, chlorophyll a, diurnal DO, turbidity, etc.). Active field investigations and site specific studies are currently underway to investigate the relationships between nutrients (stressors) and response indicators (e.g., chlorophyll a, algal biomass and algal community structure) to determine if predictive stressor-response models may be constructed that are protective of designated uses and which can be used in future assessments. These will be incorporated into the Methods Document as they are developed.

In the meantime, the Department has developed a "Technical Manual for Phosphorus Evaluations (N.J.A.C. 7:9-1.14 (c)) for NJPDES Discharge to Surface Water Permits" (<http://www.state.nj.us/dep/dwq/techmans/phostcml.pdf>), which outlines the steps to be taken to demonstrate compliance with the nutrient criteria and policy when the numeric criteria is exceeded. Further explanation can be found in Section 8.3 under the heading Delisting Protocol for Phosphorus.

Radioactivity: Prevailing regulations including all amendments and future supplements thereto adopted by the U.S. Environmental Protection Agency pursuant to Sections 1412, 1445, 1450 of the Public Health Services Act, as amended by the Safe Drinking Water Act (PL 93-523).

The Department's assessment methodology for radioactivity is covered under the Drinking Water Designated Use Assessment in Section 5.5.

Natural Conditions: The natural water quality shall be used in place of the promulgated water quality criteria of N.J.A.C. 7:9B-1.14 for all water quality characteristics that do not meet the promulgated water quality criteria as a result of natural causes.

Waterbodies that do not meet applicable SWQS criteria potentially due to natural conditions will be carefully evaluated. If the excursions cannot be conclusively attributed to natural conditions, the waterbody will be classified as "non-attaining" providing a conservative assessment. If excursions can be attributed to natural conditions, the natural water quality will be used in place of the criteria, and the elevated levels will not be considered exceedances of the applicable criteria, as per N.J.A.C. 7:9B-1.5. The Department will provide a justification where natural conditions will be used in place of the state-wide criteria. For, example the aquatic life designated use will be assessed as fully attaining if biological data indicates full attainment although violations of pH, DO or temperature may exist.

7.0 Integrated Listing Guidance

The USEPA Guidance for developing Integrated Reports (USEPA 2005) of water quality and listings of impaired water segments recommends placing the assessment results into one of five specific categories. The USEPA's Guidance defines the five categories in which a waterbody may be placed. Briefly, those categories are:

Category 1: A waterbody is attaining for all designated uses and no uses are threatened.

Category 2: Waterbody is attaining the designated use;

Category 3: Insufficient or no data and information to determine if the designated use is attained.

Category 4: Impaired or threatened for one or more designated uses but does not require the development of a TMDL. (Three sub-categories).

A. TMDL has been completed.

B. Other enforceable pollution control requirements are reasonably expected to result in the attainment of the water quality standard in the near future.

C. Impairment is not caused by a pollutant.

Category 5: The designated use is not attained. The waterbody is impaired or threatened for one or more designated uses by a pollutant(s), and requires a TMDL..

7.1 Integrated Listing Methodology

USEPA's 2006 Listing Guidance allows a state to list each waterbody only once according to the assessment unit's worst assessment or to develop the Integrated List by assessment/designated use combinations. (Note: The Department has chosen to use the term "sublist" rather than "category" when referring to the 5 parts of the Integrated List to eliminate confusion between the Category 1 of the Integrated List and Category 1 waters under Surface Water Quality Standards (SWQS)). The Department has chosen to develop the Integrated List by assessment unit/designated use combinations, not just by assessment unit. This will enable the Department to present each designated use for each assessment unit in the appropriate sublist. The Department will also identify the pollutant causing the impairment, when known, on Sublists 4 and 5. This results in the possibility of an assessment unit being placed on multiple sublists.

The Integrated Listing Method provided in Table 7.1 describes how the results of the individual assessments described in Sections 4.0 and 5.0 will be integrated to determine the listing assignment for each waterbody/designated use combination. The following are important considerations associated with the Integrated Listing Method:

- Waters on Sublist 5 of the Previous Integrated List: Waters included on Sublist 5 of the previous Integrated List are re-evaluated using all existing and readily available data and the methods described in Section 4, 5, 6, and 7 and placed in the appropriate sublist.

- Assessment units classified as “non attainment” due to impairment or threat of impairment by one or more pollutants may be reclassified to another sublist without completing a TMDL if additional data and information indicating this classification was inappropriate becomes available by the next listing cycle.
- Results of studies conducted to further evaluate relationships between designated use attainment, policies, and applicable criteria may be used to develop site-specific or watershed-specific criteria, clarify designated uses or reclassify waterbodies to another sublist without completing a TMDL. For example, studies to evaluate relationships between designated uses, nutrient policies and total phosphorus criteria are anticipated in some waterbodies that do not meet the numerical criterion.
- The USEPA guidance (USEPA, 2001) requires a TMDL only when the cause of the impairment is a pollutant (see Sublist 5B). If the impairment is caused by pollution and not a pollutant, the waterbody will be placed in Sublist 4C. Pollutant is defined in the CWA as “spoil, solid waste, incinerator residue, sewerage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal, and agricultural waste discharged into water”. Pollution is defined as “the man-made or man-induced alteration of the chemical, physical, and radiological integrity of a waterbody”.

Table 7.1: Integrated Listing Method

Assessment	Integrated Assessment	Sublist
Full Attainment	All designated uses assessed and indicate full attainment	Sublist 1: If all Designated Uses are full attainment, the Assessment Unit will be placed on Sublist 1.
Full Attainment	Designated use assessment is complete and results for the assessment indicated Full Attainment.	Sublist 2: Attaining Designated Use
Insufficient Data	Results of designated use assessment indicated “Insufficient Data”	Sublist 3: Insufficient or no data and information to determine if designated use is attained.
Non Attainment	Designated use assessment is complete and results for the assessment indicate Non-Attainment or threatened for a pollutant.	Sublist 4a: The designated use is not attained or is threatened and a TMDL has been adopted in New Jersey Register and approved by the USEPA.
Non Attainment	Non Attainment due to pollutants, other enforceable strategies being used to restore attainment status.(i.e., watershed management, non-point source controls, lake restoration plan, permitting, enforcement, finance, site remediation and other relevant water quality improvement projects)	Sublist 4b: Document water quality improvement strategies and expected time frame of SWQS attainment
Non Attainment	Non Attainment due to pollution, including impoundments, flow alterations, habitat degradation	Sublist 4c: The cause of impairment could reasonably be determined and was attributed solely to pollution.
Non Attainment	Designated use assessment is complete and results for the assessment indicate Non-Attainment.	Sublist 5 “pollutant unknown” if not known.

7.2 Determining Causes and Sources of Impairment

In making 305(b) water quality/use support assessments, the primary focus is the evaluation of existing data and information. Some of that information may include knowledge of conditions known or likely to be the source of the impairment. Many times, however, biological data, may indicate impairment but the cause and source are unknown. In other cases, monitoring staff may have knowledge of particular discharges or land use conditions that could potentially be the source and cause of the impairment, but do not have the specific information or resources to conduct a thorough investigative study to verify causes and sources. When there is definitive information regarding the cause (pollutant), the cause will be identified. If unknown, the cause will be listed as “pollutant unknown”. The pollutant sources indicated are the best estimations of staff. Once a waterbody or segment is designated for TMDL development, however, a more thorough investigative study will be conducted to determine the cause, if previously unknown, and the sources of impairment. These investigations may include more intensive ambient water quality sampling, aquatic toxicity studies, sediment or fish tissue analysis and/or dilution calculations of known discharges. In some cases the determination of causes and sources may not be possible.

7.3 Delisting

For waters listed on previous 303(d) Lists, there are several possible scenarios that may result in a waterbody being removed from a 303(d) list (Sublist 5). Each delisting will be documented. Some scenarios that could result in the removal of a waterbody from Sublist 5 follow:

1. A determination is made that the waterbody is meeting the designated use (i.e., no TMDL is required). For example:
 - A. An error was made in the initial listing causing an erroneous listing;
 - B. New Information: More recent and/or more accurate data which meets the QA/QC requirements identified in Section 5 of this Methods Document demonstrates that a designated use is being met for the waterbody (with or without a TMDL). See additional information regarding metals data in Section 8.3 below;
 - C. Revisions to the SWQS may cause a waterbody to come into compliance.
2. Reassessment of available information or data: Waterbody listed on previous 303d list is based on data which is insufficient to meet current data quality requirements. Some examples:
 - A. New Macroinvertebrate Protocol: Macroinvertebrate data had been collected under conditions not calibrated to reference conditions specified in the sampling protocol. See Section 4.1 for detailed information.
 - B. Criterion not measurable.

- C. Sufficient data not available (i.e., frequency, number of samples or QA/QC requirements not met).
- 3. TMDL has been completed. A waterbody will be removed from Sublist 5 and placed in Sublist 4a once a TMDL, which is expected to result in full attainment of the designated use, has been developed and approved by the USEPA.
- 4. Other enforceable pollution control requirements are reasonably expected to result in the attainment of the designated use in the near future. These requirements must be specifically applicable to the particular water quality problem. This includes the installation of new control equipment or elimination of discharges.
- 5. Impairment is not caused by a pollutant. In cases of biological impairment, the Department will follow its protocol to determine the cause(s) of impairment (Stressor Identification or SI) and will evaluate if these causes are pollutants to be scheduled for TMDLs or “pollution” whereby the waterbody will be transferred to Sublist 4C as per our listing methodology.
- 6. New spatial extent – When sufficient data warrants, waterbodies previously listed on a large scale may be broken down into smaller assessment units and placed in other sublists, if appropriate.
- 7. Natural causes - Waters that do not meet the designated where it can be documented that there are no human contributions to the standard exceedance. (See Section 5.1 for definition for “natural”)

Delisting Protocol for Metals (in non-tidal waters)

An Interagency 303d Technical Workgroup, including representatives from the Department, the USEPA Region II and the USGS, were tasked with developing a water quality assessment procedure for metals. This workgroup developed a procedure using New Jersey’s Whippany River Watershed in a pilot project as per the USEPA Region II and the Department’s Memorandum of Agreement (MOA) for TMDL development (March 13, 2000). This procedure is outlined below. This metals procedure will be applied in assessing the results from the previous NJ Impaired Waterbodies List and current data.

De-Listing Approach for Metals

A. When chemical data only are available

For each listed assessment unit:

Step 1: Compare metals data for a minimum of 3 samples (total recoverable and dissolved form) collected under baseflow conditions to applicable SWQS criteria. If criteria are met for all samples, proceed to Step 2; if criteria are not met for all samples, retain on the Impaired Waterbodies List.

Step 2: Collect new data under elevated flow conditions; proceed to Step 3.

Step 3: Compare data collected under elevated flow conditions to applicable SWQS criteria. If criteria are met for all samples, pursue delisting. If criteria are not met for all samples, retain on Sublist 5 and collect additional data under elevated flow conditions.

B. When biological and chemical data are available

The following applies to waterbodies previously listed on Sublist 5 for a metal in violation of an *aquatic life criterion*: if

- the criterion for that metal lies below MDL, and
- the current metal data display non detects, and
- biological data show nonimpaired conditions;

The Department will delist the assessment unit for the metal in question and place the assessment unit on Sublist 2 for Aquatic Life Support Use or Sublist 1, if all uses are assessed and attained.

If conditions #1 and #2 are met, but the biological condition (#3) is *impaired*, the site will be listed on Sublist 5 as “impaired biota, pollutant source unknown” and the metal in question will be removed from the list.

Delisting Protocol for Phosphorus

The New Jersey Surface Water Quality Standards (SWQS) include both numeric and narrative water quality criteria for Total Phosphorus (N.J.A.C. 7:9B-1.14(c)). In FW2 freshwater lakes and streams, the SWQS state:

- a) Lakes: Phosphorus, as Total P, shall not exceed 0.05 (mg/L) in any lake, pond or reservoir, or in a tributary at the point where it enters such bodies or water, except where watershed or site-specific criteria are developed pursuant to N.J.A.C. 7:9B-1.5(g)3.
- b) Streams: Except as necessary to satisfy the more stringent criteria in the paragraph above or where watershed or site-specific criteria are developed pursuant to N.J.A.C. 7:9B-1.5(g)3, phosphorus as total P shall not exceed 0.1 (mg/L) in any stream, unless it can be demonstrated that total P is not a limiting nutrient and will not otherwise render the waters unsuitable for the designated uses.

In addition, at N.J.A.C. 7:9B-1.5(g)2, the SWQS state:

- Except as due to natural conditions, nutrients shall not be allowed in concentrations that cause objectionable algal densities, nuisance aquatic vegetation, abnormal diurnal fluctuations in dissolved oxygen or pH, changes to the composition of aquatic ecosystems, or otherwise render the waters unsuitable for the designated uses.

The Department has provided technical guidance for conducting evaluations concerning total phosphorus in the “Technical Manual for Phosphorus Evaluations For NJPDES Discharge to Surface Water Permits”, dated March 2003. This document is available on the web at <http://www.state.nj.us/dep/dwq/techmans/phostcml.pdf>. These analyses are in accordance with the allowable demonstrations provided for in the Surface Water Quality Standards (SWQS) at N.J.A.C. 7:9(B)-1.14(c) to demonstrate whether or not TP is the limiting nutrient and whether or not TP otherwise renders the waters unsuitable for the designated uses. The results of these evaluations will be used to determine the applicability of the TP SWQS criteria.

In order to successfully demonstrate that the 0.1 mg/L phosphorus criterion does not apply, it must be demonstrated that phosphorus is not the limiting nutrient AND the designated uses would not otherwise be impaired.

8.0 Method to Rank and Prioritize Impaired Waterbodies

Section 303(d) of the Federal Clean Water Act requires states to rank and prioritize impaired waterbodies (i.e., waterbodies in Sublist 5B). The goal of priority ranking is to focus available resources on the right waterbodies at the right time, in the most effective and efficient manner, while taking into account environmental, social and political factors. The Department will prioritize and rank individual listings identified in Sublist 5B dependent upon the following factors:

- ◆ Importance of parameter of concern (refer to Table 8.0);
- ◆ TMDL complexity;
- ◆ Status of parameter: actively produced or legacy;
- ◆ Additional data and information collection needs;
- ◆ Sources of the pollutants;
- ◆ Severity of the impairment or threatened impairment;
- ◆ Spatial extent of impairment;
- ◆ Designated uses of the waterbodies;
- ◆ Efficiencies of grouping TMDLs for waterbodies located in the same subwatershed or for the same parameter of concern;
- ◆ Efficiencies related to leveraging water quality studies triggered by NJPDES permit renewals;
- ◆ Status of TMDLs currently under development;
- ◆ Timing of TMDLs for shared waters;
- ◆ Watershed management activities (e.g. priority watershed selection or 319 grant activities);
- ◆ Other ongoing control actions that will result in the attainment of SWQS (e.g. site remediation activities);
- ◆ Existence of endangered and sensitive aquatic species;
- ◆ Recreational, economic, cultural, historic and aesthetic importance;
- ◆ Degree of public interest and support for addressing particular waterbodies.

Table 8.0: Importance of Pollutants of Concern

Pollutant of Concern	Importance
Pathogen indicators	Direct human health issues.
Metals and Toxics	Direct human health issues. Designated use impacts.
Other conventional pollutants such as phosphorous, nitrate, pH, Dissolved Oxygen, temperature, total dissolved solids, total suspended solids, unionized ammonia	Significant designated use implications. Indirect human health issues

9.0 Method for Developing the Monitoring and Assessment Plan

The Integrated Report guidance (USEPA 2002) states that the States should include: 1) description of additional monitoring that may be needed to determine water quality standard attainment status and, if necessary, to support development of TMDLs for each pollutant/waterbody combination; and 2) schedule for additional monitoring planned for waterbodies.

Consistent with Section 106(e)(1) of the CWA, the Integrated Report will include a comprehensive Monitoring and Assessment Plan that describes the state's approach to obtaining data and information necessary to characterize the attainment status of all assessment units. Elements of this strategy include: a description of the sampling approach (i.e., rotating basin, fixed and probabilistic station array), a list of the parameters to be collected (i.e., physical, chemical, and biological), an approach to assess the data with respect to SWQS and spatial extent. The Integrated Report will include a schedule (both long term and annually) for collecting data and information for basic assessments and for TMDLs.

It is neither necessary nor practical to conduct site-specific monitoring of all waters to support comprehensive assessments. Various approaches will be employed to prioritize and target collection of new water quality data, assess data from available sources, and use advanced assessment tools such as spatial statistics, probabilistic monitoring and modeling to estimate water quality. Assessment of data is an important component of the Monitoring and Assessment Plan. Assessments may include the following:

- Comparing site-specific data to applicable SWQS;
- Estimating the spatial extent of monitoring;
- Conducting trends analyses or other statistical methods to evaluate changes in water quality over time and predict future water quality changes (i.e., threats to water quality);
- Identifying causes of impairment, particularly biological impairment; and
- Estimating the effectiveness of water quality improvement strategies (i.e., pollutant load reductions, flow alterations, TMDL implementation).

The schedule associated with the monitoring and assessment plan will consider the following priorities:

- TMDL planning and development;
- Identifying causes of impairment for waterbodies on Sublist 5B;
- Identifying waterbodies that may be impaired by pollutants and require TMDLs;
- Monitoring and assessments for waterbodies that currently have no data or insufficient data. (Monitoring and assessments may be prioritized based on existing uses (potable supply, recreational contact, aquatic life)); and
- Continuing routine monitoring for waterbodies that are currently assessed.

- It is important to recognize that monitoring and assessing each waterbody will require significant effort and can only be accomplished over the long term. Several strategies will be key to accomplishing this goal including:
- Using advanced statistical techniques to evaluate water quality in waterbodies that are not sampled based on probabilistic sampling;
- Exchanging and using data and assessments from other programs within the Department and from watershed partners;
- Expanding ongoing and planned monitoring and assessments to address data limitations identified for waterbodies on Sublist 3.

Causes of Biological Impairment: As stated above in section 7.3, in cases of biological impairment, the Department will determine the cause(s) of impairment and will evaluate if these causes are pollutants to be scheduled for TMDLs or “pollution,” whereby the waterbody will be transferred to Sublist 4C as per our listing methodology. The protocol developed by the Department is based upon methodology developed by USEPA and termed Stressor Identification or SI.

10.0 Public Participation

The Integrated Report will combine the non-regulatory Water Quality Inventory Report (305b) aspects with the more regulation-driven aspects of the Impaired Waterbodies (303d) listing procedures (i.e., only the latter triggers TMDL development). The public participation requirements of these programs are different. In general, Sublist 5 of the Integrated List is considered reporting under Section 303(d) for Impaired Waterbodies and the remaining Sublists (1 through 4) are considered reporting under Section 305(b) for Water Quality Inventory. Therefore, regulatory requirements identified in this section (regarding public participation, the USEPA approval and adoption of the Impaired Waterbodies List) apply only to Sublist 5 waters. The Department is required under 40 CFR 130.7(b)(6) to provide a description of the methodology used to develop the list as part of the 303(d) List. This Methods Document lays out the framework for assessing data and determining which of the sublists the waterbody will be assigned to (and will be provided with the Integrated List). The entire Integrated List (Sublists 1 through 5) will be provided during the public process for informational purposes only.

Request for Data

The Department provides several avenues for public noticing its intent to seek water quality-related data and information including notices in the New Jersey Register, announcements in Department generated newsletters, and direct mailings. The public notice of the request for data for the 2006 Integrated Water Quality Monitoring and Assessment Report was published in the New Jersey Register and on the Department's website on January 8, 2005 (<http://www.state.nj.us/dep/wmm/sgwqt/wat/2006-datasolicitation.pdf>). An article explaining the data solicitation process is published in the Watershed Focus Newsletter (circulation over 3000), the New Jersey Discharger (circulation) and distributed to volunteer monitoring organizations through the Department's Watershed Watch Network and the New Jersey Council of Watershed Associations list serve (over 5000 recipients). The Department is actively solicited additional groups and organizations for data they may have knowledge of including local, state, and federal agencies, members of the public, and academic institutions. (See Table 1 for the mailing list.)

The Department also has ongoing efforts to continuously interact with other data collecting organizations and facilitate the exchange of information. The New Jersey Water Monitoring Coordinating Council was established on October 24, 2003 which serves as a statewide body to promote and facilitate the coordination, collaboration and communication of scientifically sound, ambient water quality and quantity information to support effective environmental management. The Council consists of representatives from various Divisions within NJDEP, USEPA Region 2, Delaware River Basin Commission, the Pinelands and Meadowlands Commissions, academia and the volunteer monitoring groups and provides the opportunity to exchange information and data.

The Department, through its Volunteer Monitoring Program, has been working to identify which groups collect data and are interested in submitting it for use in Integrated Reports. The Office of Outreach and Education in the Division of Watershed Management is responsible for the coordination of the Volunteer Monitoring Program and the Watershed Watch Network. The Watershed Watch Network is a program acting as an umbrella for all of the volunteer monitoring programs within New Jersey. Volunteer Monitoring Program Managers throughout the State make up the Watershed Watch Network Council. A four-tiered approach has been developed to allow for volunteers to pick their level of involvement based on what the purpose of their monitoring program is, what the intended data use is and who the intended data users are. The goal of this new program is to provide acceptable protocols and QA/QC requirements for volunteers if they chose to submit their data to the NJDEP, to assist volunteers in designing and building upon their existing programs and assist data users in gathering sound data for their uses. Additional information on the four-tier approach is available at http://www.nj.gov/dep/watershedmgt/volunteer_monitoring.htm

The time period for submitting data is specified in the public notice and extends for six months. For most of the assessments, the Department uses the most recent 5 years of data. The 2006 assessment will use of January 1, 2000 to December 31, 2004 as the 5 year period. As such, the 2006 Integrated Report will report the status of New Jersey's waters through 2004. This is consistent with the neighboring states of Delaware and Pennsylvania as well as the Delaware River Basin Commission. The "cut-off" date after which no additional data or information will be considered in the preparation of the 2006 Integrated Report is necessary to allow the timely completion of a draft list that can be distributed for public review and comment. Data packages, which include data collected through December 31, 2004 will be accepted until July 15, 2005 for the development of the 2006 Water Quality Limited Segments List. Data collected after December 31, 2004 and data packages submitted after July 15, 2005 will be considered for subsequent Water Quality Limited Segments Lists and/or other Department assessments.

In determining which data are appropriate and readily available, the Department will consider quality assurance/ quality control, monitoring design, age of data, accurate sampling location information, data documentation and use of electronic data management. A data package should include:

- The approved quality assurance project plan (QAPP). More information on QAPPs may be reviewed at http://www.epa.gov/region2/qa/air_h20_qapp04.pdf and <http://www.epa.gov/quality1/qapps.html> Data provided in electronic format, preferably STORET (data may also be provided in Excel) on floppy disc, ZIP drive or CD ROM. Electronic data cannot be accepted via e-mail or over the web at this time.
- Station location data should be provided in an ESRI shapefile or compatible format when possible. Station locations identified by latitude and longitude must also be

mapped on a USGS Quadrangle Sheet (or copy of section of a sheet with the name of the sheet identified); and,

- A citable report summarizing the data that includes name address, and telephone number of the entity that generated the data set.

Data received through this solicitation may be used to: confirm an existing impairment; list a new impairment; delist an impairment; or identify waterbodies which are unimpaired. Quality assurance considerations are particularly important because the adopted Water Quality Limited Segments List is used to establish priorities for water quality improvement measures, including, as appropriate, TMDL development. Given the importance and long-term ramifications of the Water Quality Limited Segments List, the Department will only use data which meet the following quality assurance requirements for listing purposes:

- Data packages must include a Department approved Quality Assurance/Quality Control Project Plan (QA/QC/Plan) prepared in accordance with “Guidance for the Development of Quality Assurance Project Plans for Environmental Monitoring” (EPA Region II, May 1, 1999);
- All samples, including replicates, blanks and recovery spikes, shall be collected in conformance with the Department’s Field Sampling Procedures Manual (1992) [NJEDL: NJDEP Field Sampling Procedures Manual](#);
- Sampling locations must be accurately documented to within 200 feet;
- Laboratory samples must be analyzed at a State certified lab; and
- Analytical testing methods shall be by methods for which the laboratory is certified by the Department’s Office of Quality Assurance, USEPA or USGS

The regulations require all existing and readily available data and information be considered but not necessarily used to make an assessment decision during the reporting process. The results of a comprehensive data and information solicitation process can generate data and information that varies in quality. The many entities responding to the State’s data and information solicitation may collect and compile data that follows a variety of field, laboratory and analytical protocols. Therefore, it is reasonable to expect that the Department may not consider all data and information in the same manner. The Department will use, in its assessment determinations, all relevant data that are consistent with the Department’s quality assurance requirements as outline above. The rational for not using specific data will be described in detail in the Integrated Report.

The Department is working with data-generating organizations to organize their data, provide training in acceptable sampling techniques, and certify laboratories and field measurement protocols. The Department also provides a spreadsheet on the web to help organizations report their data in such a way as to ensure the data is readily available for use in developing the Integrated Report.

Public Notice

The Department will publish notice of the availability of the Integrated Water Quality Monitoring and Assessment Methods and Draft Integrated List in the New Jersey Register, on the Department Website, and in newspapers of general circulation throughout the State. Adjacent states, federal and interstate agencies shall also be notified, as necessary. The public notice shall include the following:

- A description of the procedures for comment on the proposed Sublist 5; and
- The name, address and website of the office in the Department from which the proposed Integrated List may be obtained and to which comments may be submitted.

Comment Period

The comment period on a proposed Sublist 5 (303(d)) shall be a minimum of 30 days.

Public Hearings

Within 30 days of the publication of the notice, interested persons may submit a written request to extend the comment period for up to 30 days. If the Department determines that there are significant environmental issues or that there is a significant degree of public interest, the comment period shall be extended. If granted, notice of an extension of the comment period shall be published promptly on the Department Website.

Final Action

After the close of the public comment period, the Commissioner shall render a decision on Sublist 5B [303(d) List], which will be the final agency action. The Commissioner may:

1. Adopt Sublist 5B as proposed;
2. Adopt Sublist 5B with changes which do not significantly change the public notice regarding the proposed List; or
3. Re-propose all or portions of Sublist 5B.

When the commissioner has adopted Sublist 5B, the Department will public notice the adopted list in the New Jersey Register and submit the adopted list to the USEPA for approval in accordance with 40 CFR 130.7.

Availability of Final Documents

The Integrated Report, which will include the Integrated List, monitoring needs, and schedules, TMDL needs and schedules, as well, any other information usually included in the 305(b) Report, will be submitted to the USEPA as required by Section 305(b) of the Clean Water Act. The Department will post the availability of the Integrated Report on its web page at that time.

11.0 References

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